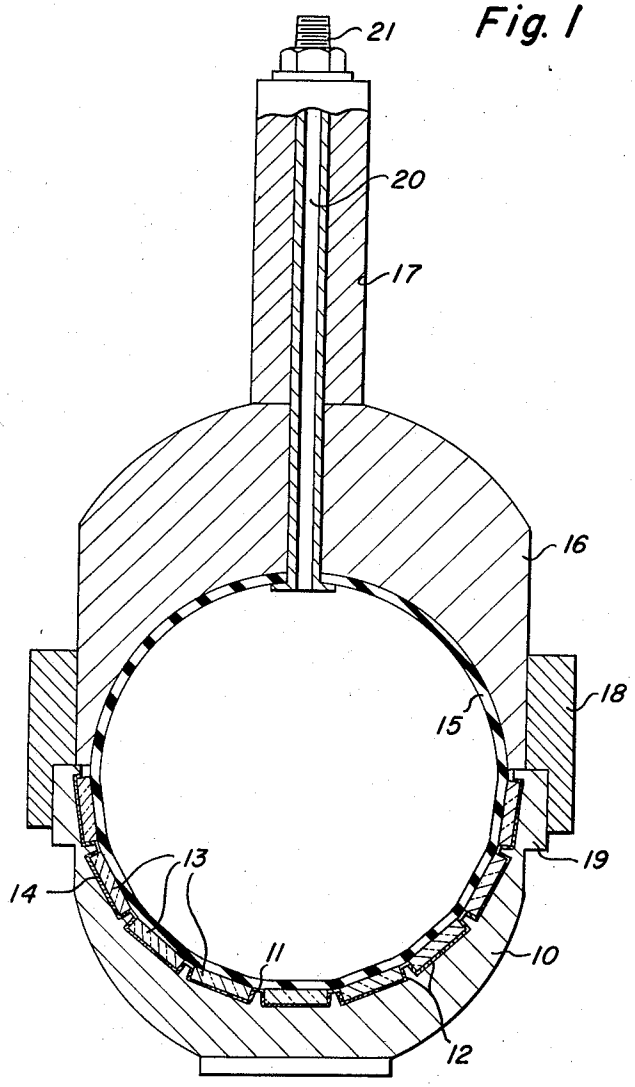
June 17, 1958 J. A. BLASH 2,838,892

LENS BLOCKING DEVICE

Filed June 28, 1956 2 Sheets-Sheet 1

Fig. 1



JOSEPH A. BLASH
INVENTOR.

BY Daniel I. Mayne.
Earl T. Paramore.
ATTORNEYS

June 17, 1958 J. A. BLASH 2,838,892

LENS BLOCKING DEVICE

Filed June 28, 1956 2 Sheets-Sheet 2

Fig. 2

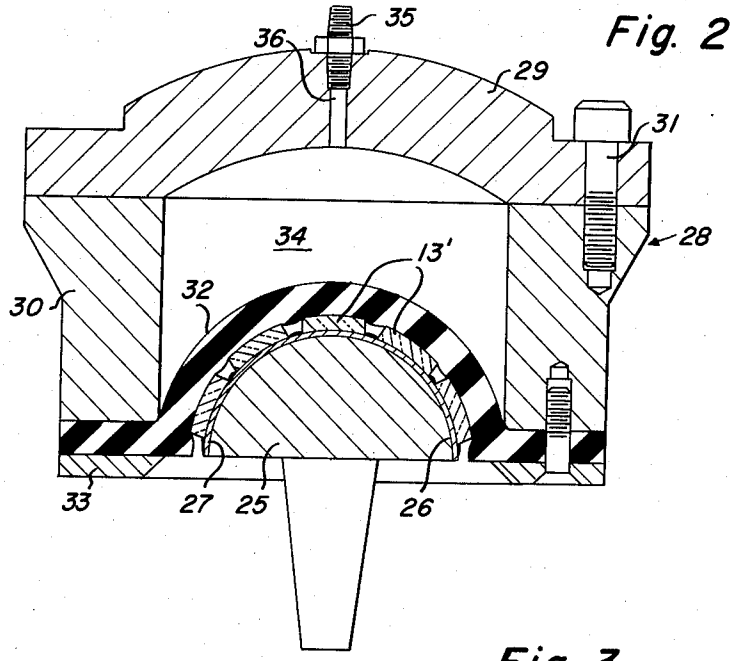
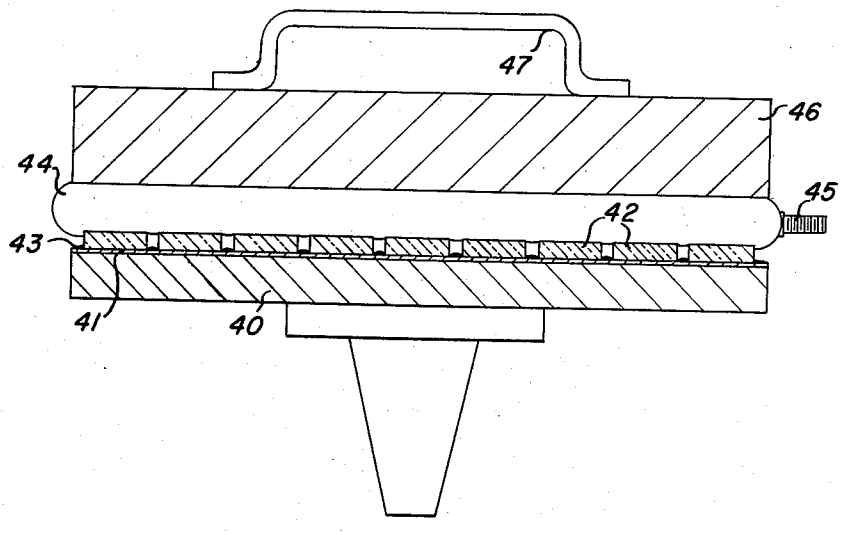


Fig. 3



JOSEPH A. BLASH
INVENTOR.

BY Daniel I. Mayne.

Earl T. Harmon
ATTORNEYS

United States Patent Office 2,838,892 Patented June 17, 1958

2,838,892

LENS BLOCKING DEVICE

Joseph A. Blash, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a corporation of New Jersey

Application June 28, 1956, Serial No. 594,603

5 Claims. (Cl. 51—277)

The present invention relates to the blocking of optical elements preparatory to performing an abrading operation thereon, and particularly to a blocking apparatus useful in a high-speed lens blocking technique wherein a plurality of optical elements are simultaneously blocked on a single blocking surface where they can be simultaneously ground and/or polished to a desired curvature.

The conventional procedure of blocking lens blanks for an abrading operation is to fasten a plurality of the blanks on a suitable blocking surface by means of pitch or other thermoplastic adhesive. In such procedures the blocking of the lens blanks has been a problem because the blanks do not remain against the blocking surface, or a seat therein, once they have been pressed into place because the blanks tend to float on the molten blocking pitch. In some cases the blanks are pressed into proper position against the blocking surface by finger pressure. This practice requires attention, time, and offers no guarantee that all blanks will be pressed. If the blanks are not accurately pressed into position on the blocking surface, there is a prohibitive percentage of rejects caused by excessive runout (wedging) or by too little center thickness (thin) following the abrading action. Inasmuch as the blanks may vary in thickness, it is necessary that the pressing means be such that it is capable of applying pressure to each blank irrespective of any variation in thickness between them. Pressing tools have been made of sponge rubber but such tools have been found to be unsatisfactory because the blocking pitch and the heat affect the sponge rubber to a point where only the thickest blanks get pressed into position. Such pressing tools also have the disadvantage that the blocking pitch adheres to the rubber and cannot be readily disengaged therefrom.

The primary object of the present invention is to provide a device for blocking optical elements onto accurately made blocking bodies in such a manner that rejects caused by excessive runout or by too little center thickness will be completely eliminated or reduced to a minimum.

Another object is to provide a blocking device of the type mentioned which includes an air cushion having a surface which is adapted to engage and apply uniform pressure to each and every one of the lens blanks to press them onto the blocking surface, and which cushion may, or may not, be provided with a valve for inflating and deflating the same.

And another object is to provide a blocking device of the type described which is particularly designed for blocking lens blanks on a concave hemispherical blocking surface and which includes a hollow rubber ball as the blank engaging and pressing tool.

And a further object is to provide a blocking device which is simple and inexpensive to manufacture and use notwithstanding the fact that it is most efficient in operation.

The novel features which I consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its methods of operation, together with additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a blocking device constructed in accordance with one embodiment of the present invention and particularly designed for blocking lens blanks on a concave hemispherical blocking surface for the generation of a concave surface on the exposed surface of the blanks;

Fig. 2 is a vertical sectional view of a blocking device adapted for blocking lens blanks on a convex hemispherical blocking surface for the generation of a convex surface on the blanks; and

Fig. 3 is a vertical sectional view of a blocking device for seating optical elements on a flat blocking surface for the generation of flat surfaces on the elements.

In Fig. 1 there is shown a device for blocking lens blanks on a concave blocking surface for the generation of concave surfaces on the blanks. The device comprises a metal blocking body **10** having a concave hemispherical blocking surface **11** which may, or may not, be provided with a plurality of accurately formed seats **12** in each of which a lens blank **13** is adapted to be seated and held by a layer of blocking pitch **14**, as is well known. The pitch may be initially applied directly to the rear surface of each lens blank before it is placed on the blocking surface or it may be applied directly to the blocking surface. It is then melted by heating the blocking body and the lens blanks are pressed into accurate position on the surface while the pitch is in molten condition. After the blanks are properly seated, the pitch is allowed to cool and set up to hold the blanks in position for a subsequent abrading operation.

According to the present invention, the pressing tool consists of a circular air cushion **15** having a diameter substantially the same as the inside diameter of the blocking surface, said air cushion being adapted to engage and apply pressure to each and every one of the lens blanks **13** when the cushion is inserted into the blocking body. In this instance, the air cushion **15** may comprise a hollow rubber ball purchased from a toy shop or it could be made from any heat resistant flexible material such as Neoprene or Koroseal or sheet rubber suitably molded. Toy rubber balls are particularly desirable because they are available in a variety of sizes, very inexpensive and can be quickly and easily replaced if and when they fail for any reason.

The upper portion of the air cushion, or ball, **15** is confined by a rigid and heavy pressing weight **16** which is used to either apply a downward pressure to the ball or to oppose any expansion of the ball providing the same is inflated with air. For conveniently raising the pressing tool from, and inserting it into, the blocking body, the weight may be provided with a handle **17**. The pressing weight **16** may also be provided with a guiding flange **18** which is adapted to telescope with a flange **19** on the blocking body to properly align these two parts. The air ball **15** may be cemented, or otherwise fastened, to the pressing weight **16** so as to be removable from the blocking body therewith, or it can be a part separate therefrom.

If the inherent stiffness of the ball or cushion **15** is sufficient to withstand the pressing weight **16**, then no air need be introduced thereinto. However, if it is necessary to inflate the cushion or ball, a valve stem **20** may be passed through the handle **17**, the pressing weight and into the ball as shown in Fig. 1 and also act as a means for attaching the ball to the pressing weight as shown. This valve stem may include a conventional threaded valve indicated at **21** to which an air line may be connected for inflating a ball. After the pressing weight

and ball are brought into contact with the lens blanks positioned on the blocking surface, the ball can be expanded by the introduction of air at 2 to 5 p. s. i. depending upon the blocking size. The expansion of the ball or cushion, either due to introduced air or compression by the pressing weight, as the case may be, assures evenly distributed pressure to all lens blanks regardless of small variations in blank thickness or blocking angles. When a large ball is used, only enough air pressure need be applied to the ball or cushion to keep the ball from collapsing under the pressing weight.

While the ball type air cushion is particularly useful in cases where the blocking surface approaches a concave hemisphere, the principle is applicable from concave hyperhemispherical blocks through plano to convex hyperhemispheres. In Fig. 2 there is shown an embodiment of the present invention designed for blocking lens blanks on a convex hemispherical blocking surface. The blocking body **25** has a convex hemispherical surface **26** on which the lens blanks **13'** are adapted to be held by a layer of pitch **27**. In this case the pressing weight **28** is cup-shaped and formed by a dome portion **29** being fixed to one end of a tubular portion **30** by bolts **31** to form an air-tight joint between the two. The other open end of the tubular portion **30** is closed by a flexible (rubber) diaphragm **32** clamped to the end wall of the tubular portion **30** by a ring **33** to provide an air-tight cavity **34** behind the diaphragm. Air can be introduced into this cavity through a valve **35** threaded into a bore **36** in the dome portion. This air-filled cavity and diaphragm **32** thus forms an air cushion which will apply pressure to all lens blanks, regardless of variation in thickness thereof, when the blocking body is inserted into the pressing weight against the diaphragm, as shown in Fig. 2.

In Fig. 3 an embodiment of the present invention for blocking optical elements on a flat blocking surface is shown. Here the blocking body **40** has a flat blocking surface **41** on which a plurality of optical elements (optical flats) **42** are adapted to be held by a layer of pitch **43** to have an optically flat surface generated on their exposed surfaces. In this case the optical elements **42**, after being placed on the blocking surface, are covered with a relatively thin and flat air cushion **44** having a valve **45** by means of which the cushion can be inflated. Atop this cushion there is placed a pressing weight **46** having a flat bottom and a handle **47** by means of which the weight can be lifted from the blocking body. As before, the air cushion ensures pressure being applied uniformly to all optical elements regardless of any difference in thickness between them. If desired, the cushion **44** can be cemented to the flat bottom of the pressing weight **46** so that it will be lifted from, or placed on, the blocking body along with the weight.

It will thus be understood that with a lens blocking device of the type disclosed, all of the disadvantages of the conventional blocking devices are overcome. By using a compressible and/or inflatable air cushion as the actual pressure transmitting member, a uniform pressure is applied to all lens blanks regardless of any variation in their thickness or the manner in which they are spaced around the blocking surface. Since the surface of the air cushion is smooth, there is little tendency for any pitch to adhere to it. Any pitch that does stick to the cushion can be readily removed by merely expanding and contracting the same by repeatedly inflating and deflating the cushion.

While I have shown and described certain specific embodiments of my invention, I am aware that many modifications thereof are possible. My invention, therefore, is not to be limited to the specific structural details shown and described, but is intended to cover all modifications coming within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a lens blocking device the combination with a blocking body having a blocking surface on which a plurality of lens blanks are adapted to be mounted through the use of pitch for an abrading operation of their exposed surfaces, of a hollow blocking tool filled with a fluid and having a resilient wall adapted to engage all of the exposed surfaces of the lens blanks on said blocking surface when the tool is brought down against said blanks, whereby said resilient wall takes a shape substantially complementary to that of the blocking surface and presses all of said lens blanks into contact therewith regardless of any difference in thickness between the blanks.

2. In a lens blocking device the combination with a blocking body having a substantially hemispherical concave blocking surface on which a plurality of lens blanks are adapted to be seated through the use of pitch for an abrading operation, of means for pressing each of said blanks against said blocking surface regardless of any difference in the thickness thereof, said means comprising a hollow rubber ball having an outside diameter substantially the same as the inside diameter of said blocking surface, a rigid hemispherically concave pressing tool fastened to said ball and confining the upper portion thereof against deformation, and means for raising said pressing tool from and lowering it to an operative position wherein the exposed portion of said ball extends into and is confined by said blocking body and the lens blanks seated thereon.

3. A lens blocking device according to claim 2 and including means for inflating and deflating said rubber ball.

4. In a blocking device for blocking optical elements having flat surfaces for an abrading operation the combination with a blocking body having a flat blocking surface on which a plurality of elements are adapted to be mounted through the use of pitch for an abrading operation of their exposed surfaces, a relatively thin air-filled cushion adapted to be positioned on the exposed surface of said optical elements and being large enough to embrace all of the same, and a pressing weight adapted to be placed on top of said cushion and having a substantially plane surface comparable in size to the blocking surface which engages said cushion.

5. In a lens blocking device the combination with a blocking body having a substantially hemispherical convex blocking surface on which a plurality of lens blanks are adapted to be seated through the use of pitch for an abrading operation, of means for pressing each of said blanks against said blocking surface regardless of any difference in thickness thereof and comprising a cup-shaped pressing weight having an open end whose diameter is larger than that of the blocking body whereby the two can be moved into telescoping relation, a resilient diaphragm stretched across the opening in said pressing weight and connected to the walls thereof so as to provide an air-tight cavity behind said diaphragm, and means for introducing air into said cavity whereby the diaphragm acts as an air cushion to apply pressure to all blanks on the blocking body when the body and pressing weight are telescoped to deform said diaphragm.

References Cited in the file of this patent

UNITED STATES PATENTS

2,357,867	Babbitt et al.	Sept. 12, 1944
2,441,108	Turner	May 4, 1948
2,509,211	Clement	May 30, 1950
2,736,993	Tripp	Mar. 6, 1956