July 18, 1961 C. J. PEARSON 2,992,519

APPARATUS FOR SURFACING AND POLISHING OPTICAL GLASS AND OTHER ARTICLES

Filed Feb. 18, 1960

2 Sheets-Sheet 1

FIG. 3.

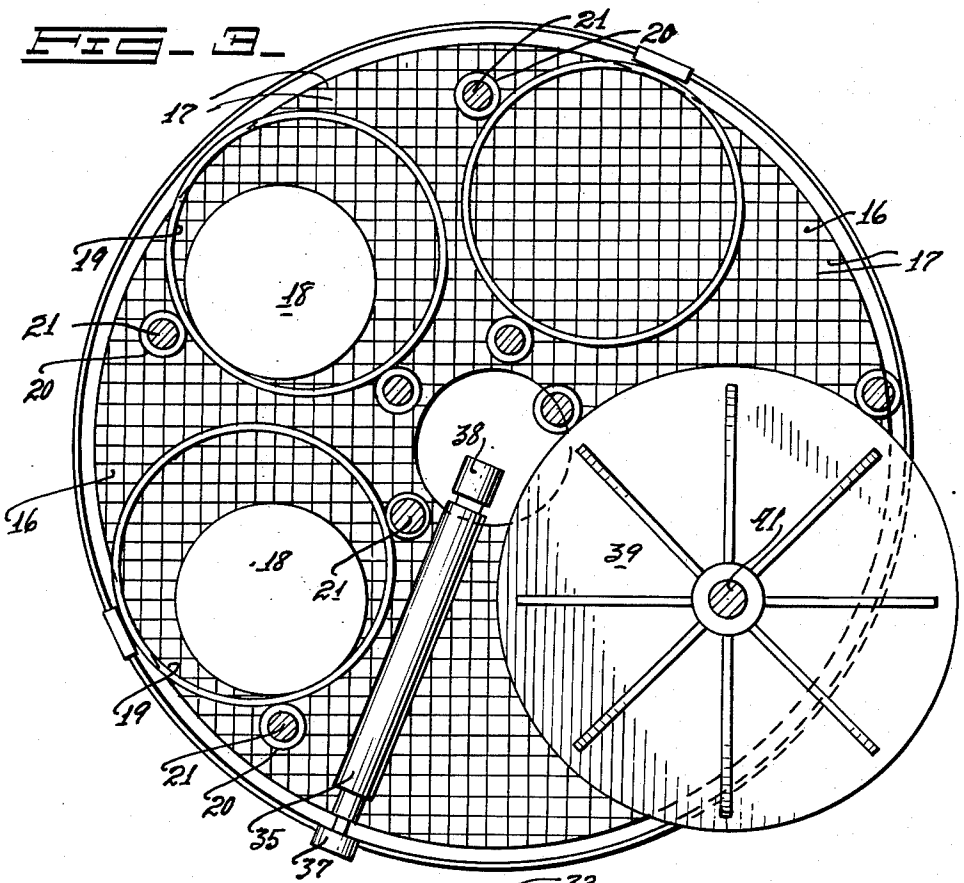


FIG. 1.

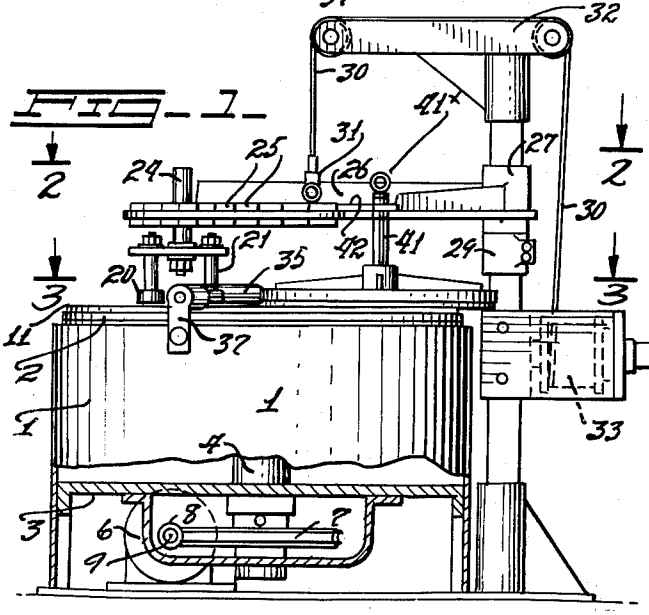
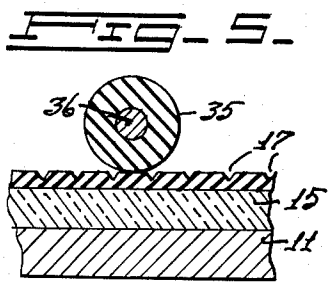


FIG. 5.



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FIG. 2.

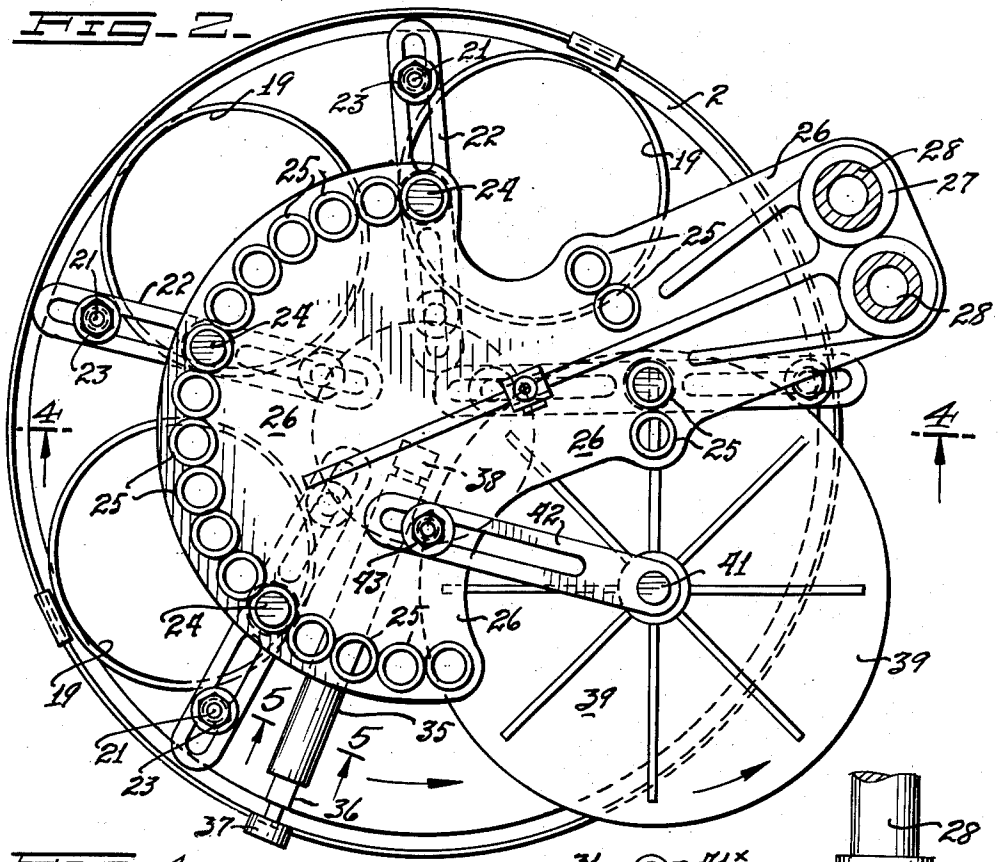
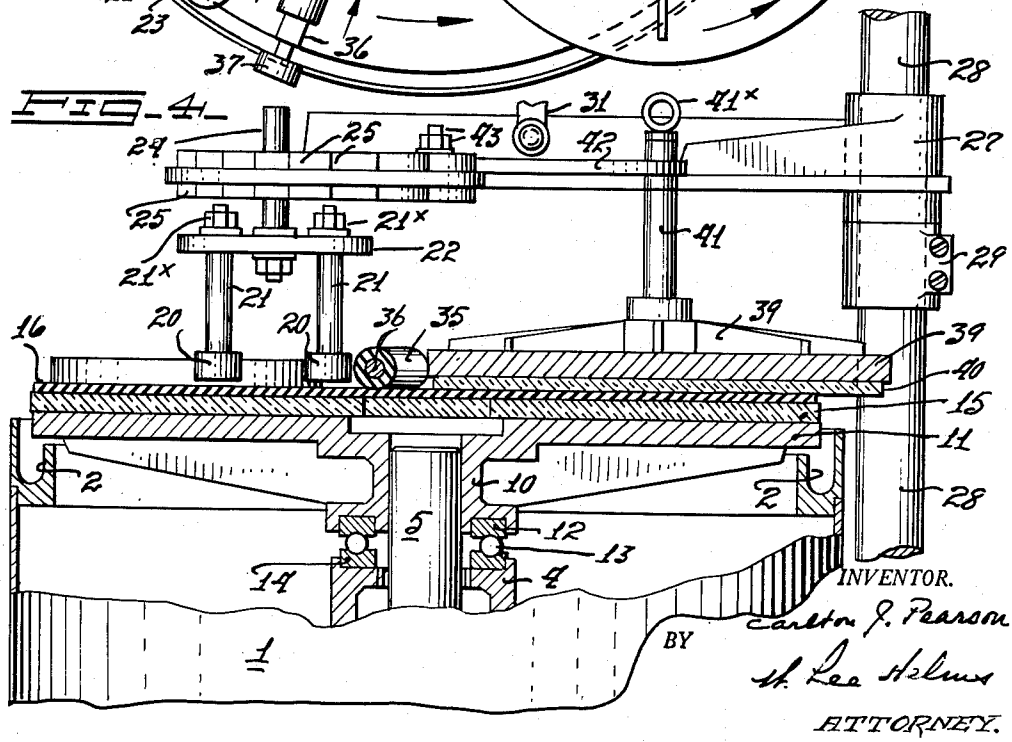


FIG. 4.



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APPARATUS FOR SURFACING AND POLISHING OPTICAL GLASS AND OTHER ARTICLES

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5 Claims. (Cl. 51—129)

The present invention relates primarily to the final surfacing of optical glass members, including lenses and prisms, although the apparatus is adapted for fine surfacing of other articles where there is necessity for high degree of accuracy. The action of the various types of apparatus used in the industry for such purpose does not result in such accuracy as to eliminate imperfect results, requiring replacement of the work after inspection and repeated action by the apparatus, whereas the apparatus of the present invention overcomes such deficiencies and by test has been proven to operate with great accuracy.

The primary characteristic of the invention is the employment above the lapping disk, and in addition to the usual abrasive distributor, of a relatively heavy rotary flat surface member which bears upon the upper surface rotary polishing or grinding plate and which, in the present embodiment, is free for rotation by and through frictional contact with the polishing or grinding plate.

The invention will be described with reference to the accompanying drawings, in which:

FIG. 1 is a view in elevation showing the apparatus, partly broken away;

FIG. 2 is a horizontal section, somewhat enlarged over the proportions of FIG. 1, and taken on the line 2—2, FIG. 1;

FIG. 3 is a horizontal section taken on the line 3—3, FIG. 1;

FIG. 4 is a fragmentary section taken vertically on the line 4—4, FIG. 2;

FIG. 5 is a schematic view in vertical section through the abrasive distributing roller and the polishing-grinding disk or plate.

Referring first to FIGS. 1 and 4, the apparatus consists of an annular casing 1, at the top of which is secured a trough member 2. Within the casing 1 is a cross member 3 which carries a central tubular support 4. Through this support is run a drive shaft 5 which may be driven by reduction gearing from an electric motor 6, but which in the present embodiment carries a worm wheel 7 driven by a worm 8 on motor shaft 9.

The upper end of drive shaft 5 is secured within depending bearing sleeve 10 of what will now be termed the polishing disk 11. Preferably the bearing sleeve carries a wear ring 12, under which are ball bearings 13 engaging a ring 14 carried by tubular member 4.

The polishing disk 11 is a strong and rigid member generally made of steel, preferably surfaced with a heavy glass plate 15, surfaced with the customary asphaltic layer 16. As indicated at 17 in FIG. 3, and also in FIG. 5, the asphaltic layer is grooved and the grooves preferably cross each other in regular progression.

The lens or other relatively small member to be polished are, as customary, cemented or otherwise held to the under surfaces of holding plate 18, FIG. 3, and are restrained against displacement from the polishing disk by restraining ring members 19, which in turn are prevented from movement off the polishing disk, each by a plurality of rollers 20, carried by shafts 21, and shown more particularly in FIGS. 3 and 4.

Shafts 21 are adjustably held by bracket arms 22 which are slotted, and by loosening nuts 23 on the shafts they may be adjusted to desired position.

Each set of two bracket arms 22 is carried by shaft 24 held within one of an arcuate series of sleeves 25 carried by a bracket arm 26, so that the shafts 24 may be placed in various positions as desired. The rear end of bracket arm 26 is formed with two opposite bearing bosses 27, by which bracket arm 26 may be received upon supporting shaft 28, and these shafts may be tubular as shown in FIG. 2, or solid as shown in FIG. 4. On each shaft the bearing boss 27 may rest upon a tubular bearing support 29 carried by said shaft.

It will be seen that the supporting shafts for the rollers 20 are threaded at their upper end to receive nuts 21x bearing upon the brackets 22. Each shaft 24 which carries a bracket may be adjustably fixed in its selected sleeve 25 by any suitable means, such for example as a set screw for each sleeve.

Bracket arm 26 has, in the present embodiment, an upstanding rib connected to a cable 30, the cable having a lower connection 31 with the rib, and on the top area of one or both of the shafts 28 is mounted a pulley carrying support for the cable, indicated at 32, by which the cable is led to a drum 33 adapted to be operated by a crank 34. By such means the bracket arm 26, with all of the members carried thereby, may be elevated, or brought again into operative position.

A distributing roller is provided for application of abrasive to the surface of the polishing disk 11, the roller being indicated at 35. It is on a shaft 36 and may rotate on such shaft, the ends of which may be held in any suitable manner, as by a bracket member 37 carried by casing 1 and a second bracket member 38, as indicated in FIG. 3. The distributing roller and its manner of support forms no part of the present invention, and the supports are shown only schematically. It will be understood that the abrasive composition will have a flow characteristic, and hence the utility of a trough 2.

An adjustable truing plate 39 is the primary factor in the accurate operation of the apparatus. It is necessary that this truing plate be heavy and rigid, that it should have a very smooth under surface, preferably of hard glass, as indicated at 40, and that its weight and pressure is imposed, through its glass surface, directly upon the hard grooved asphaltic face of the polishing disk. This instrumentality prevents irregularity in the face of the polishing disk, which heretofore had seriously affected the optical glass under treatment. In a practical embodiment of the apparatus, the truing plate assembly was given a weight of about 750 pounds, and this may be taken as one operative example. The truing plate carries a guide shaft 41 which rises through an aperture in a bracket arm 42, the latter having an elongated slot which receives a nut and bolt connection 43 with bracket arm 26, and by which the position of truing plate 39 relatively to the polishing disk may be adjusted. Shafts 41 for the truing plate is freely movable through the aperture and bracket 42, and carries at its top an eye member 41x, to which cable 30 may be secured for raising and lowering the truing plate.

In the operation of the apparatus, the polishing disk is rotated, and this may be counter-clockwise. The flowable abrasive composition is applied to abrasive distributor roller 35 and is spread over the hard asphaltic lead 17 and into its grooves. When the distribution is uniform, the optical glass holders 18 are placed in position, as shown in FIG. 3, so that they are free for some movement within the rings 19, rollers 20 preventing displacement of the holders 18. As the surface 16 of the polishing disk moves under the truing plate 39, the latter has a double action. Being free on shaft 41, it will rotate, being perfectly flat at its under surface, and having considerable weight and pressure, it will maintain the working surface of the polishing disk exactly true and will so act upon the flowable abrasive as to effect uniformity thereof in all surface areas of the facing 16.

Having described my invention, what I claim and desire to secure by Letters Patent is as follows:

1. An optical polishing and lapping apparatus comprising a rotary polishing plate and means for rotating the same, the plate having an uppermost working surface adapted to carry abrasive, and adapted to receive holding elements for optical glass or other work articles to be acted upon, in combination with a truing plate adapted to impose pressure upon the working surface of the polishing disk, the truing plate having surface contact with the polishing disk and being adapted for rotation thereby, and an abrasive applicator roller carried in advance of the truing plate according to the direction of rotation of the rotary polishing plate, a plurality of sets of restraining rollers for ring members adapted to surround holders for the aticles to be acted upon, shafts carrying said rollers, slotted brackets in which the shafts are adjustable, a bracket arm fixed against lateral movement but movable toward and from the polishing disk, and power means for raising and lowering the bracket arm.

2. An optical polishing and lapping apparatus constructed in accordance with claim 1, in combination with an abrasive applicator roller carried in advance of the truing plate according to the direction of rotation of the rotary polishing plate, a plurality of sets of restraining rollers for ring members adapted to surround holders for the aticles to be acted upon, shafts carrying said rollers, slotted brackets in which the shafts are adjustable, a fixed bracket arm overlying the polishing disk, and a plurality of apertures in said bracket arm for selectively receiving mounting elements carried by the slotted bracket.

3. An optical polishing and lapping apparatus constructed in accordance with claim 1, in combination with an abrasive applicator roller carried in advance of the truing plate according to the direction of rotation of the rotary polishing plate, a plurality of sets of restraining rollers for ring members adapted to surround holders for the articles to be acted upon, shafts carrying said rollers, slotted backets in which the shafts are adjustable, a bracket arm fixed against lateral movement but movable toward and from the polishing disk, and power means for raising and lowering the bracket arm.

4. An optical polishing and lapping apparatus comprising a rotary polishing plate and means for rotating the same, the plate having an uppermost working surface adapted to carry abrasive, and adapted to receive holding elements for optical glass or other work articles to be acted upon, in combination with a truing plate adapted to impose pressure upon the working surface of the polishing disk, the truing plate having surface contact with the polishing disk and being adapted for rotation thereby, an abrasive applicator roller carried in advance of the truing plate according to the direction of rotation of the rotary polishing plate, a plurality of sets of restraining rollers for ring members adapted to surround holders for the articles to be acted upon, shafts carrying said rollers, slotted brackets in which the shafts are adjustable, a bracket arm fixed against lateral movement but movable toward and from the polishing disk, power means for raising and lowering the bracket arm, a shaft carried by the truing plate and projected upwardly, and a bracket receiving said shaft and adjustably carried by the bracket arm.

5. An optical polishing and lapping apparatus comprising a rotary polishing plate and means for rotating the same, the plate having an uppermost working surface adapted to carry abrasive, and adapted to receive holding elements for optical glass or other work articles to be acted upon, in combination with a truing plate adapted to impose pressure upon the working surface of the polishing disk, the truing plate having surface contact with the polishing disk and being adapted for rotation thereby, and an abrasive applicator roller carried in advance of the truing plate according to the direction of rotation of the rotary polishing plate, a plurality of sets of restraining rollers for ring members adapted to surround holders for the articles to be acted upon, shafts carrying said rollers, slotted brackets in which the shafts are adjustable, a bracket arm fixed against lateral movement but movable toward and from the polishing disk, power means for raising and lowering the bracket arm, the truing plate being in the form of a disk and having a highly polished lower surface adapted to immediately contact the facings of the polishing disk, the truing plate carrying an upstanding shaft, means carried by the bracket arm for adjusting the shaft toward and from the axis of the polishing disk, and power means for raising and lowering said shaft and the truing plate which carries it.

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