

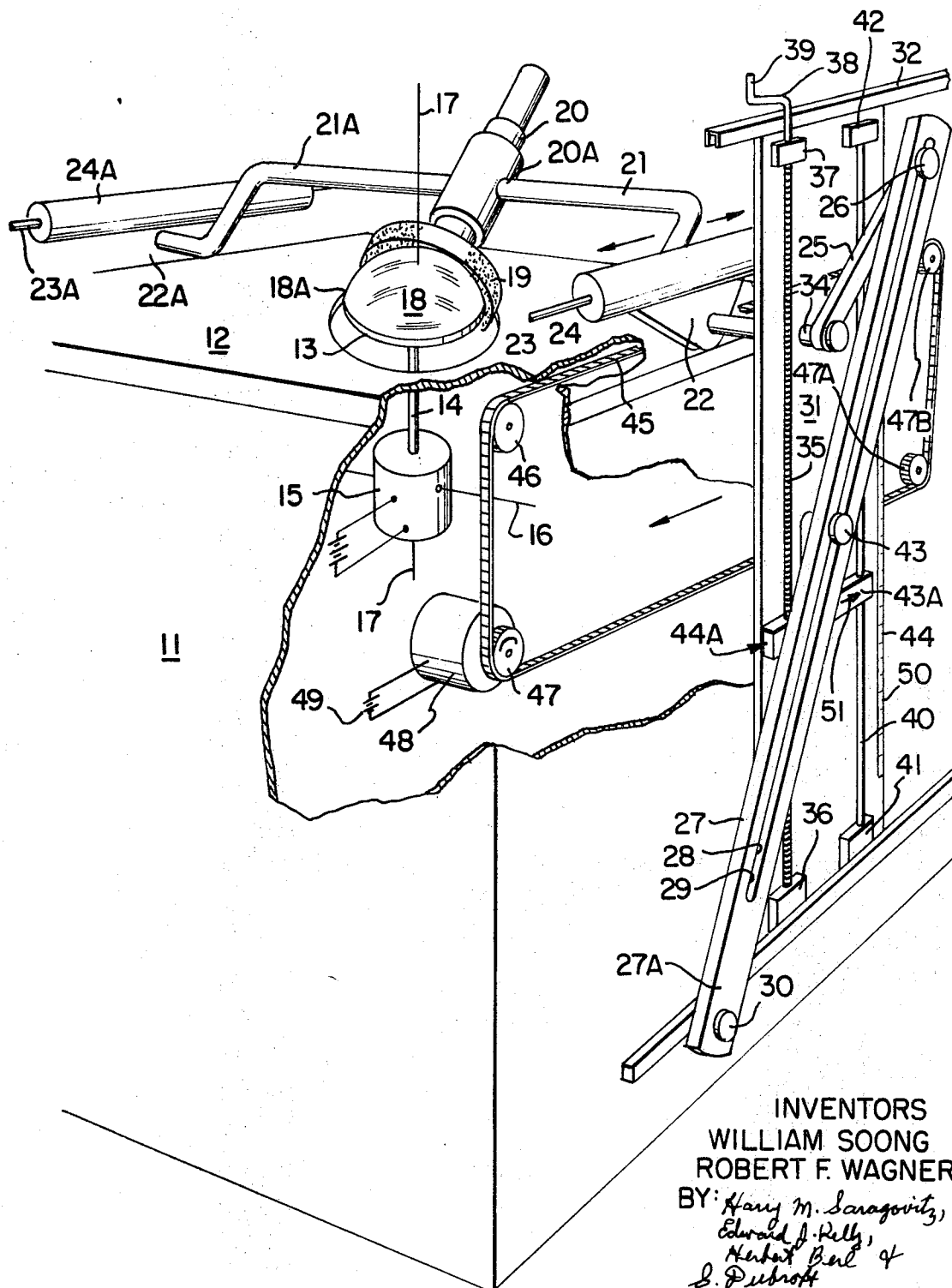
Oct. 20, 1970

W. E. SOONG ET AL

3,534,506

LENS POLISHING APPARATUS

Filed May 17, 1968



INVENTORS
WILLIAM SOONG
ROBERT F. WAGNER
BY: *Harry M. Saragovitz,*
Edward J. Kelly,
Herbert Berl of
S. Dubroff
ATTORNEYS

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3,534,506

LENS POLISHING APPARATUS

William E. Soong, Chicago, and Robert F. Wagner, Lombard, Ill., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Army

Filed May 17, 1968, Ser. No. 730,039

Int. Cl. B24b 7/00, 9/00

U.S. Cl. 51—58

6 Claims

ABSTRACT OF THE DISCLOSURE

A lens polishing machine is provided with a carriage which supports a tool carrying yoke for operative oscillation relative to a mounted lens. The yoke has a crank arm with a protruding crank pin which engages a slot wall in a pivotally mounted, slotted elongated link. An elongated, horizontally slidable member, connected to the yoke crank arm and having a longitudinally adjustable pin positioned within the link slot, simultaneously rotates and translates the yoke relative to the lens. The pin is longitudinally adjusted to grind a predetermined contour in the mounted lens.

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to us of any royalty thereon.

In conventional lens polishing machines, a lens is supported for rotation about a vertical axis and a polishing tool is positioned for oscillation in a predetermined radius of curvature relative to the lens. The polishing tool must be supported in such a manner as to exert a considerable pressure on the surface of the lens which is being polished, and when this pressure is not directed normal to the radius of curvature of the lens surface, a side thrust on the lens and the tool is developed. This side thrust tends to induce scratching of the lens surface as well as other undesirable optical properties.

It is, therefore, an object of this invention to provide a lens polishing apparatus which is capable of maintaining a predetermined polishing tool pressure normal to the surface of a suitably supported lens.

It is another object of this invention to provide an adjustable lens polishing machine which is capable of maintaining a polishing pressure normal to the surface of a variety of lenses each having a surface with a predetermined radius of curvature.

Other objects, features, and advantages of this invention will become apparent from a perusal of the following specification taken in conjunction with the accompanying drawing which is a perspective view, partially broken away, showing a lens polishing machine embodying features of the invention.

A polishing machine housing 11 has a horizontal top surface 12 through which projects a rotatable table or support 13 to which is secured lens 18. Table 13 is rotated about vertical axis 17 by means of a suitable electric motor 15 which is connected to table 13 by shaft 14. Motor 15 is supported to be tilted about horizontal axis 16 for orienting lens 18 in a predetermined position for operative engagement with polishing tool 19.

A polishing tool 19 is firmly secured to air cylinder 20 which is connected to an adequate supply of pressurized air (not shown). The air pressure within cylinder 20 may be varied by any conventional regulating means to adjust the polishing pressure between tool 19 and lens surface 18A.

A yoke 20A, constructed to receive and support air cylinder 20, has symmetrical arms 21 and 21A extending

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diametrically outwardly therefrom. Arms 21 and 21A, shown in a position rearward of lens 18, are supported for horizontal or longitudinal movement by a carriage which includes a pair of elongated support members 24, 24A that are adapted to slide along parallel horizontal or longitudinal rails 23, 23A. Along with members 24, 24A are bearings 22 and 22A which rotatably receive yoke arms 21 and 21A respectively.

At the outermost end of outwardly projecting arm 21 is a crank 25 which may be attached to yoke arm 21 by any expedient connecting means. At the extreme end of crank 25 is crank pin 26 which is shown in operative engagement with wall portion 29 of longitudinal slot 28 formed within elongated link 27. It is preferable for crank pin 26 to be freely rotatable so that it will be in rolling contact with slot wall 29 for reducing frictional forces therebetween.

One end 27A of slotted elongated link 27 is pivotally mounted on machine housing 11 by means of a conventional stud or pin 30. This mounting permits link 27 to oscillate about pin 30 in cooperation with the angular oscillation of crank arm 25.

Positioned within slot 28 in link 27 is pin 43 which has a vertically elongated portion 43A located inwardly of link 27. Integral with elongated pin portion 43A is a body portion 44 which forms a rigid pin assembly shown generally at 44A. Pin assembly 44A is vertically translatable with respect to member 31, and pin 43 should be constructed in a manner to provide for free rotation similar to that of crank pin 26 if optimum results are to be achieved.

Vertically elongated plate-like member 31 has a screw 35 mounted parallel therewith. Screw 35 is rotatably secured at its lower end by a suitable bearing block 36 with bearing block 37 rotatably securing the upper end of screw 35 to member 31. A crank 38, having a handle portion 39, is inserted within bearing block 37 for operative engagement with screw 35 for rotating screw 35 about its longitudinal axis. Secured to member 31 in parallel spaced relationship with screw 35 is rod like member 40 which is suitably connected to member 35 by blocks 41 and 42 located at the extreme vertical ends thereof.

Body portion 44 of pin assembly 44A is bored or drilled for operatively receiving screw 35 and rod 40. Body 44 is internally threaded along one bore for engaging mating threads on screw 35, so that as screw 35 is rotated by crank 38, pin assembly 44A is vertically translated relative to member 31.

Member 31 is supported for horizontal or longitudinal movement forwardly and rearwardly of lens support table 13 by means of parallel, vertically spaced tracks 32 and 33. A bearing or journal 34 is mounted on member 31 inwardly of crank arm 25 for rotatably receiving a portion of outwardly extending yoke arm 21.

Connected to the forward end of carriage member bearing 22 is a roller chain 45 which extends forwardly around idler sprocket 46, downwardly around motor sprocket 47, and rearwardly over idler sprockets 47A and 47B to connect with the rearward portion of carriage bearing 22. A reversible electric motor 48, having an appropriate power supply 49, is connected to motor sprocket 47. Counterclockwise rotation of motor 48 draws chain 45 around motor sprocket 47 to cause carriage members 24 and 24A to be translated forwardly of lens table 13 along guide rails 23 and 23A respectively. As carriage member 24 reaches the forwardmost extremity of its longitudinal translation, a conventional motor reversing switch not shown, reverses the direction of rotation of motor 48 to cause carriage members 24A and 24 to be translated rearwardly of lens table 13. Contact with a similar switch mounted at the rear of the

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rails again reverses motor 48 to operatively oscillate the carriage relative to the lens table. It is to be noted that means other than a reversible electric motor and chain drive may be substituted for oscillating the carriage as appropriate design considerations may warrant.

A graduated scale 50 is attached to member 31 along the rearwardmost vertical end thereof, and a pointer 51 is secured to body portion 44 of pin assembly 44A. Pointer 51 and scale 50 aid in adjusting pin assembly 44A for polishing lenses having a predetermined radius of curvature. For example, the location of pointer 51 with respect to scale 50 for a desired lens polishing radius of curvature may be determined by theoretical calculations or trial and error. Pin assembly 45A may then be adjusted to any calculated or pre-tried location by merely rotating screw handle 38 to align pointer 51 with a desired reference position on scale 50.

As would be readily apparent to one skilled in the art, a series of polishing tools may be positioned in spaced relationship along yoke arm 21 and 21A for operatively engaging a plurality of similarly spaced rotatable lens tables. It would also be obvious to secure more than one lens to table 13 for polishing by tool 19.

In operation, a suitable lens polishing compound is placed intermediate lens surface 18A and polishing tool 19 by an operator who adjusts the air pressure within air cylinder 20 to provide a predetermined polishing pressure between tool 19 and lens surface 18A. If desired, motor 15 may be slightly tilted about axis 16 to enable the tool to polish lenses having a greater than hemispherical surface. Power is then applied to motor 15 and and supported lens 18 is thereby rotated about axis 17.

Motor 48 rotates drive sprocket 47 which engages roller chain 45 to translate carriage member 24 and 24A forwardly of lens 18 along horizontally supported rails 23 and 23A. Carriage bearings 22 and 22A act on yoke arms 21 and 21A to impart forward horizontal motion thereto. Yoke arm 21, rotatable within bearing 34, moves member 31 forwardly along with carriage member 24. As member 31 moves forwardly, pin 43 of pin assembly 44A, which has been adjusted at a predetermined location, engages wall 29 of slot 28 and rotates link 27 about mounting stud 30. The rotation of link 27 will cause crank pin 26 to rotate yoke arm crank 25 in cooperation therewith with the combined oscillatory rotation and translation of yoke arm 21 relative to lens 18 causing polishing tool 19 to traverse lens 18 in a predetermined radius of curvature. When the yoke arm carriage reaches its forwardmost position the direction of rotation of motor 48 will be reversed and the carriage will then move rearwardly where upon reaching its rearwardmost position motor 48 will again be reversed. The carriage assembly will then oscillate forwardly and rearwardly of lens 18 until the desired polishing effect is achieved and the operator stops the machine.

In adjusting the machine to polish lenses having relatively small radii of curvature, screw 35 is rotated by means of handle 38 to move pin 43 vertically upward. Pin assembly 44A is so constructed as to permit pin 43 to be moved vertically upwardly past bearing 34 thereby enabling the machine to polish lenses having a small radius curvature. Downward adjustment of pin 43, conversely, will increase the polishing radius of curvature.

While a preferred embodiment of the invention has been disclosed various modifications, alterations, or changes thereof may be resorted to without departing from the spirit and scope of the invention as defined in the appended claims.

We claim:

1. A shaper comprising
 - a tool for forming a contour on a body,
 - a yoke for supporting said tool in operative relationship with said body, said yoke having a laterally extending arm with a crank at one end thereof, said crank having an outwardly projecting crank pin,
 - an elongated link having a longitudinal slot receiving

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said crank pin, said link having a wall portion defining said slot in contact with said crank pin, said link being pivotally mounted at one end for cooperative motion with said crank,

- a member rotatably receiving said yoke arm intermediate said crank and said tool, said member having an outwardly protruding pin slidably received by said link slot,

means for guiding said member forwardly and rearwardly of said tool, and

means for imparting longitudinal motion to said yoke relative to said body, so constructed and arranged that said body may be traversed and worked upon by said tool with a controlled applied pressure.

2. The arrangement as defined in claim 1 wherein said member pin is adjustably mounted on said member.

3. An article shaping machine comprising
 - a tool for shaping a surface on an article,

a yoke for positioning said tool in operative engagement with said article, said yoke having a pair of symmetrical arms extending diametrically outwardly from said tool with one of said arms having a crank connected to the outermost end thereof, said crank having an outwardly projecting crank pin,

- a carriage for supporting and longitudinally moving said yoke and tool relative to said article, said carriage having bearings rotatably receiving said yoke arms,

means for guiding said carriage along a predetermined longitudinal path, said path being located perpendicular to said diametrically extending yoke arms,

an elongated link having a longitudinal slot receiving said crank pin, said link being pivotally mounted at one end for cooperative motion with said crank,

an elongated member positioned intermediate said crank and said carriage, said member having a bearing rotatably receiving said yoke arm inwardly of said crank, said member also having an adjustable outwardly protruding pin slidably received by said link slot, said pin being adjustable for varying the radius of curvature through which said tool moves,

track means for longitudinally guiding said member forwardly and rearwardly of said article, and means for imparting longitudinal motion to said carriage.

4. A lens polishing machine comprising

means for supporting at least one lens in a predetermined position,

a tool for grinding a contour in said lens,

a yoke for positioning said tool in operative engagement with said lens, said yoke having a pair of symmetrical arms extending diametrically outwardly from said tool with one of said arms having a crank connected to the outermost end thereof, said crank having an outwardly projecting crank pin,

- a longitudinally reciprocating carriage having bearings rotatably receiving said outwardly extending yoke arms,

means for longitudinally guiding said carriage forwardly and rearwardly of said lens, said guiding means including a pair of straight parallel rails with each rail being spaced a predetermined distance outwardly from and on opposite sides of said lens support means,

an elongated link having a slot slidably receiving said crank pin, said link being pivotally secured at one end for cooperative movement with said crank,

a vertically positioned elongated member located intermediate said crank and one of said bearings, said member having a journal rotatably receiving said yoke arm inwardly of said crank,

track means for longitudinally guiding said member, said means including a pair of vertically spaced tracks extending a predetermined distance forwardly and rearwardly of said lens support means,

an elongated rotatable screw mounted on an outward

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side of said member and extending parallel there-
with,
an outwardly protruding pin having a body portion ad-
justably moveable by said screw, said pin being
slidably received by said slotted link,
means for rotating said screw a predetermined amount 5
to vary pin location relative to said member, said
pin location being representative of the radius of
curvature through which said tool moves, and
means for imparting longitudinal reciprocal motion to 10
said carriage whereby said yoke and tool move in an
arcuate path over said lens to grind a predetermined
contour therein.
5. The arrangement as defined in claim 4, further in-
cluding 15
means for rotating said support means about a verti-
cal axis.

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6. The arrangement of claim 5 wherein said support
means is tiltable about an axis normal to said vertical
axis.

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JAMES L. JONES, Jr., Primary Examiner

U.S. Cl. X.R.

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