Aug. 3, 1954 C. A. ELLIS 2,685,153

BEVEL EDGING MACHINE AND METHOD

Filed Sept. 22, 1949

3 Sheets-Sheet 1

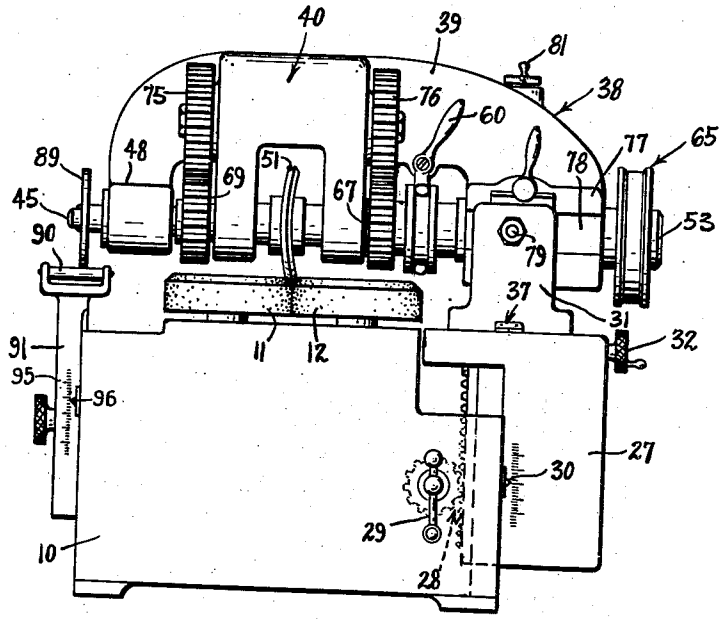


Fig. 1

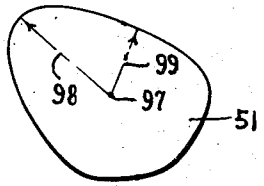


Fig. 4

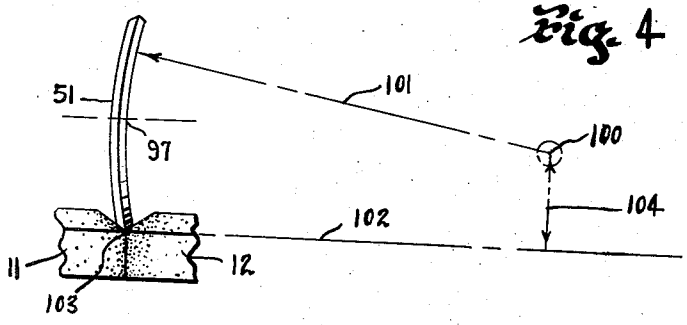


Fig. 5

INVENTOR.
CHARLES A. ELLIS

BY

ATTORNEY

Aug. 3, 1954

C. A. ELLIS

2,685,153

BEVEL EDGING MACHINE AND METHOD

Filed Sept. 22, 1949

3 Sheets-Sheet 2

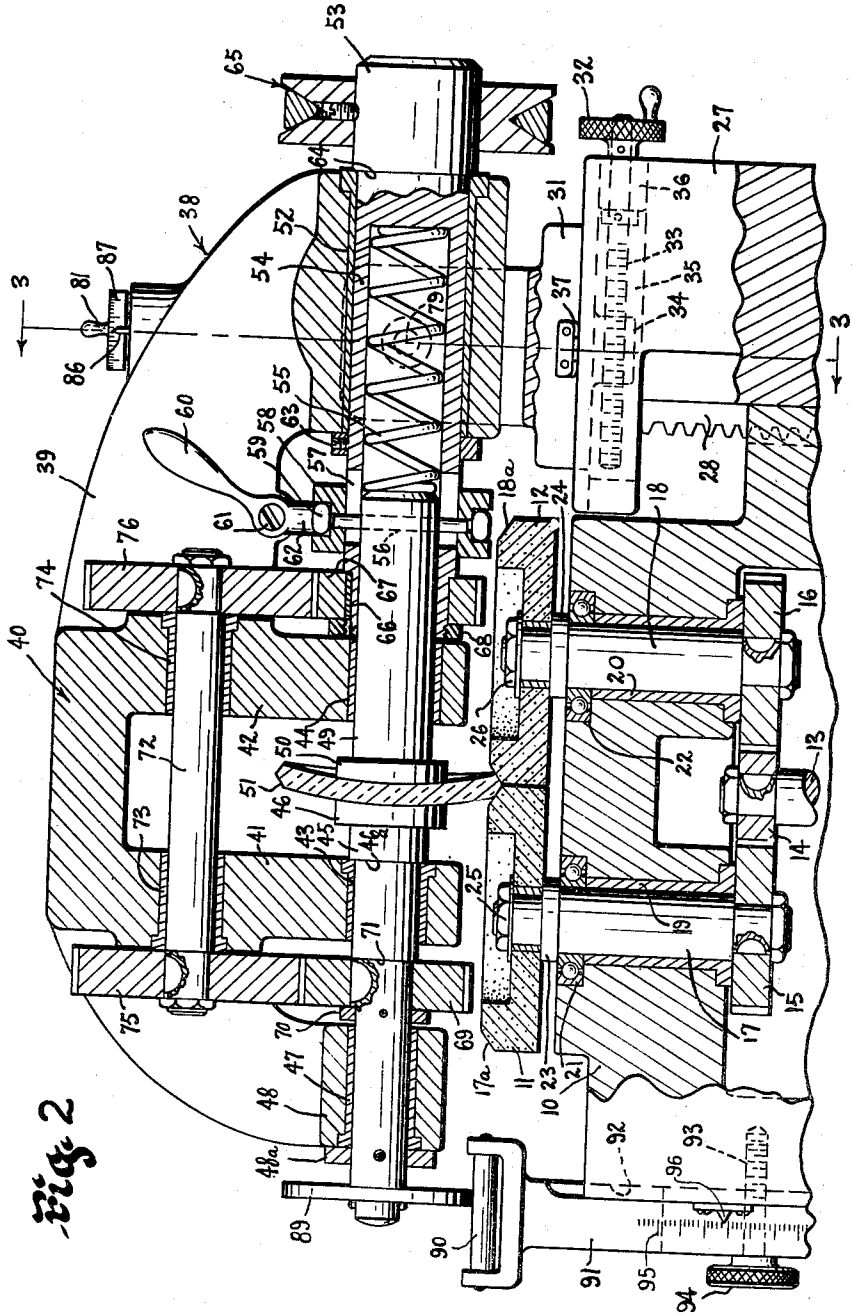


Fig 2

INVENTOR.
CHARLES A. ELLIS

BY

Louis A. Gagnon

ATTORNEY

Aug. 3, 1954 C. A. ELLIS 2,685,153

BEVEL EDGING MACHINE AND METHOD

Filed Sept. 22, 1949

3 Sheets-Sheet 3

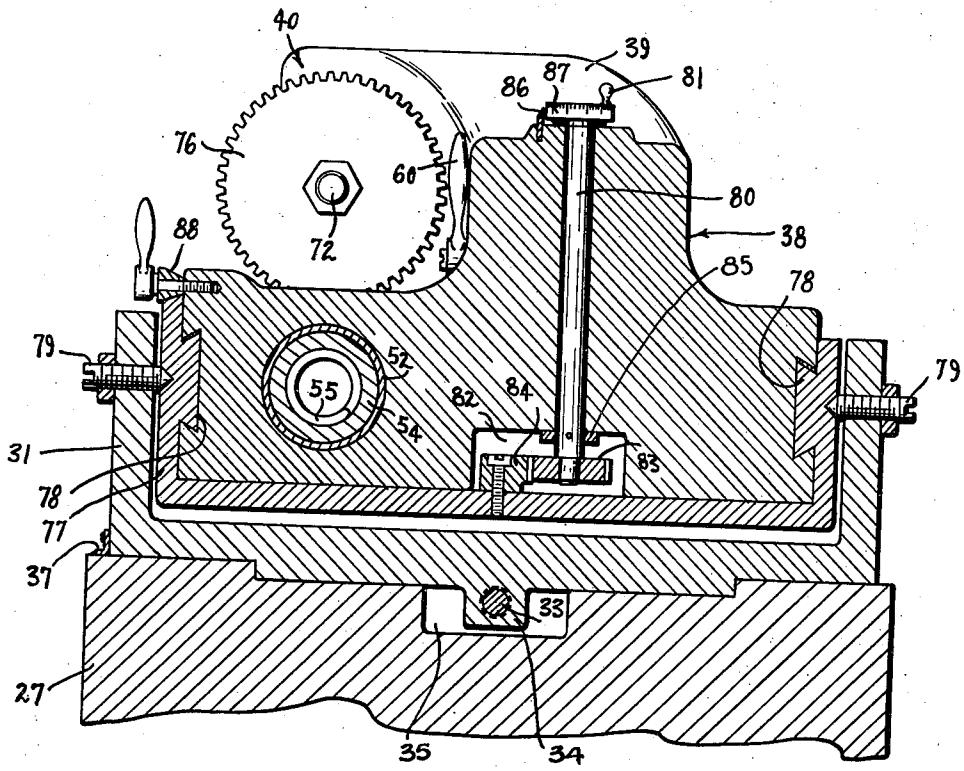


Fig. 3

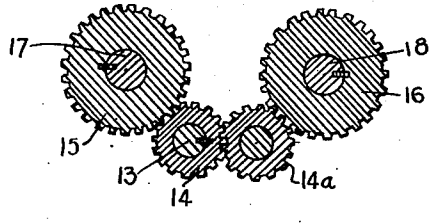


Fig. 6

INVENTOR.
CHARLES A. ELLIS

BY

Louis A. Gagnon

ATTORNEY

Patented Aug. 3, 1954

2,685,153

UNITED STATES PATENT OFFICE

2,685,153

BEVEL EDGING MACHINE AND METHOD

Charles A. Ellis, Southbridge, Mass., assignor to American Optical Company, Southbridge, Mass., a voluntary association of Massachusetts

Application September 22, 1949, Serial No. 117,170

13 Claims. (Cl. 51—89)

1

This invention relates to improvements in edge grinding machines and has particular reference to novel means and method of forming beveled edges on articles such as ophthalmic lenses.

A principal object of the invention is to provide improved means and method of forming beveled edges on articles such as ophthalmic lenses and embodying a machine having a pair of rotatable abrading elements and means for carrying an article for rotation and for arcuate movement into and out of position for abrasion by said abrading elements about an axis substantially normal to the axes of rotation of the abrading elements and at a controlled position with respect to said abrading elements in accordance with the shape to which the particular article is to be edged.

Another important object is to provide novel means and method of the above character embodying a pair of rotatable abrading wheels shaped to have beveled edges and disposed in contiguous edgewise relation with one another with the bevels at the point of adjacency between the wheels forming a groove, and means for carrying an article for rotation and for arcuate movement into and out of said groove about an axis substantially normal to the axes of rotation of the abrading wheels and at a distance above the plane defined by the apex of the groove equal to substantially one-half the sum of the longest and shortest distance of the edge from a predetermined center of the article.

Another object is to provide a machine of the above character embodying means for moving an article toward and away from the abrading means, during the edge abrading thereof, in an arc of radius substantially equal to the radius of the base curve or a curve intermediate the base curve and the prescriptive curve of the article, said radius being variable in accordance with the contour shape and base curve radius of the particular article to be edged.

Another object is to provide means and method of the above character embodying a pair of abrading wheels rotatable about parallel axes, the abrading wheels having beveled edges and disposed in adjacent edgewise relationship so that the bevels will form a groove at the area of adjacency of the wheels, and means for carrying an article for rotation and for arcuate movement into and out of said groove about an axis substantially normal to the axes of the wheels, said center of said arcuate movement being adjustable with respect to the plane defined by the apex of the groove in a direction parallel to said axes

2

of the wheels and in a direction substantially normal to said axes.

Another object is to provide an automatic machine of the above character for forming beveled edges on articles such as ophthalmic lenses which is relatively simple in its construction and operation, efficient, and comparatively economical to manufacture.

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

Fig. 1 is a front elevational view of a machine embodying the invention;

Fig. 2 is a fragmentary sectional view illustrating the operative parts of the device;

Fig. 3 is a fragmentary sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a front elevational view of an irregularly shaped lens;

Fig. 5 is a diagrammatic illustration of the method of locating the axis of movement of the lens carrying means; and

Fig. 6 illustrates alternative means for driving the abrading wheels.

Ophthalmic mountings are commonly constructed so as to have lenses positioned within rims encircling the peripheries of the lenses either partially or entirely and the rims generally are provided throughout their inner contour edges with grooves in which the lenses are adapted to be snugly fitted. Therefore, so that the lenses will properly fit within the grooves in the rims of such mountings, it is essential that the lenses be provided with beveled edges shaped to align as nearly as possible with the grooves.

In providing irregularly shaped lenses with beveled edges, however, by prior art methods, the bevels throughout the peripheries of the lenses are generally not shaped to properly fit the grooves, that is, such a lens may have the apex of the bevel spaced at different distances from the side surface of the lens at various points along the edge where such points are located at varying distances from the geometrical center of the lens. In such cases the apex of the bevel will be irregular and crooked throughout the periphery of the lens and will thus necessitate that the rim encircling the lens will be bent, twisted, reshaped or otherwise distorted to properly receive the lens with the constant danger of imparting a strain on the lens and possible breakage thereof.

The above disadvantages are practically nonexistent in the presently described device wherein the irregularly shaped lens or other article is

moved arcuately into and out of abrading position about an axis disposed from the lens a distance substantially equal to the radius of the base curve of the lens, with the position of said axis with respect to the abrading wheels being adjustable in accordance with the varying radii from a predetermined center of the lens.

Referring more particularly to the drawings wherein like characters of reference designate like parts throughout the several views, the present invention is embodied in a machine comprising a base 10 having located thereon suitable conventional mechanism for causing simultaneous rotation of a pair of abrading wheels 11 and 12. Such mechanism will be under control of any suitable power device utilized to cause rotation of means such as a shaft 13 (Fig. 2) having keyed thereto at one end a gear 14 which is adapted to mesh with spaced adjacent gears 15 and 16. The gears 15 and 16 are attached to the inner ends of respective shafts 17 and 18 which project through and are rotatably mounted in supporting portions of the base 10 and which carry at their outer ends the respective abrading wheels 11 and 12. These shafts 17 and 18 may be suitably mounted for efficient operation without displacement such as by positioning them in tubular bushings 19 and 20 having ball bearing units 21 and 22 disposed at their respective upper ends and upon which enlarged portions 23 and 24 of the respective shafts 17 and 18 are adapted to reside.

The abrading wheels 11 and 12 are substantially disc-shaped and are provided with central openings through which the end portions of the shafts 17 and 18 are adapted to extend, with one side surface of each of the wheels resting upon the enlarged shaft portions 23 and 24. The opposed side surfaces of the wheels are provided with central recessed areas so that nuts 25 and 26 can be used to secure the wheels to the shafts without projecting above the plane of the surface of the wheels.

The shafts 17 and 18 are located so as to position the wheels 11 and 12 in intimate edgewise relation with one another, as shown in Figs. 1 and 2, and each wheel is provided peripherally thereof on its upper edge with bevels 17*a* and 18*a* whereby at the area of adjacency between the wheels there is formed a substantially V-shaped groove having its apex disposed exactly at said point of adjacency.

Although the foregoing description refers to means for causing the abrading wheels 11 and 12 to rotate in opposite directions, the wheels may, if desired, be caused to rotate in similar directions by other simple and efficient mechanisms such as by interposing an idler gear 14*a* of the same size as drive 14 between said drive and gear 16 as illustrated in Fig. 6.

Adjustably carried at one side of the base 10 is a supporting member 27 which is adapted to be moved in a direction parallel to the axis of the abrading wheels 11 and 12. The mechanism for moving the member 27 can be any suitable conventional device such as the rack and pinion device 28 shown in Fig. 1, which is manually operable by means of a handle 29 located for easy accessibility to the operator at the front of the machine, with the amount of movement of the member 27 being registered by means of an indicator and scale arrangement 30.

A substantially U-shaped holder 31 is mounted on the top of the supporting member 27 and is adjustable in a direction transverse to the rack and pinion adjustment and toward and away

from the abrading wheels along a line intersecting the axes of said wheels 11 and 12 upon manual rotation of a crank 32. The crank 32 is secured to the outer end of a shaft 33 (Figs. 2 and 3) which is threaded into a portion 34 depending from the underside of the holder 31 into an elongated recessed portion 35 of the member 27, and is rotatably supported in one or more bearing portions 36 formed on the member 27. Thus, when the crank 32 is rotated, this will cause the holder 31 and all parts of the device mounted thereon to be adjusted in a direction transversely as specified above. The amount of movement of the parts during this adjustment can be controlled in accordance with a scale and indicator arrangement 37.

A transversely disposed lens carrying device 38 is adjustably carried by the holder 31 and comprises an elongated head 39 having a substantially inverted U-shaped supporting portion 40 formed integral therewith. The arm portions 41 and 42 of the supporting portion 40 are provided with concentric transverse bores adjacent their lower ends, which bores contain bushings 43 and 44 respectively. A rotatable shaft 45 is located in the bushing 43 in arm portion 41 and has one end extending into the space between the arm portions 41 and 42 and carrying a resilient article engaging pad 46 thereon. The shaft 45 is rotatably supported adjacent its other end in a bushing 47 carried by a forwardly projecting portion 48 of the head 39 and prevented from displacement in one direction by a collar 48*a*, the end portion carrying the pad 46 being enlarged to form a shoulder 46*a* abutting against the bushing 43 to prevent displacement in the opposite direction. The bushing 44 rotatably carries a second shaft 49 similar to and concentric with the shaft 45, the shaft 49 having a resilient article engaging pad 50 similarly secured to its inner end.

The pads 46 and 50 can be spaced sufficiently to permit an article such as a lens 51 to be inserted therebetween since the shaft 49 is mounted for sliding movement longitudinally in the bushing 44. The head 38 is provided with a bore concentric with the shaft 49 having a bushing 52 therein. A shaft 53 is rotatably mounted in this bore and has a hollow interior forming a tubular end portion 54 in the end thereof directed toward shaft 49, which portion contains a coiled tension spring 55, one end of which is adapted to contact the base of the hollow in the portion 54 with its other end abutting and exerting pressure against the end of the shaft 49. Thus, the shaft 49 is constantly urged toward the shaft 45.

However, to permit the shaft 49 to rotate with the shaft 53 and yet be adjusted outwardly in a direction longitudinally of said shaft 53 as when a lens 51 is being positioned between the pads 46 and 50, there is provided conventional means such as a pin 56 which is inserted through the shaft 49 and extends through opposed slots 57 in the tubular portion 54 of the shaft 53. Since the sides of the slots 57 bear against the pin 56, this will cause rotating movement of shaft 53 to be transmitted to shaft 49. The ends of the pin 56 are adapted to reside in a ring member 58 encircling the shaft portion 54 and rotatable therewith, the ring member 58 being provided peripherally thereof with a circumferential groove in which is positioned a yoke 59. The ring member 58 rotates freely within the yoke 59 and is moved longitudinally of the shaft 53 upon operation of a handle 60 pivotally con-

nected at 61 to the head 39. The handle 60 is connected to the yoke 59 by a linkage 62 whereby movement of said handle in a counter clockwise direction about its pivot 61, will move the ring member 58, pin 56 and shaft 49 against the tension of the spring 55, and will thus space the lens carrying pads 46 and 50 sufficiently to permit the lens 51 to be inserted therebetween. Upon release of the handle 60, the spring 55 will act to return the parts to their initial positions with the pads 46 and 50 firmly contacting the opposed side surfaces of the lens 51.

The shaft 53 is meanwhile constantly retained in position within the bushing 52 by means of a collar 63 and shoulder portion 64 which engage opposite ends of the bushing 52.

Suitable conventional mechanism may be employed for causing rotation of the shaft 53 and consequently of shafts 49 and 45 such as by providing power mechanism connected to the shaft 53 by means such as a belt and pulley arrangement 65.

The tubular shaft portion 54 has a portion 66 of reduced outside diameter at its inner end to which is keyed a gear wheel 67, with a collar 68 being threaded or otherwise secured to the end of the portion 66 to prevent the gear wheel 67 from becoming displaced. A similar gear wheel 69 is keyed to the shaft 45 and maintained in position thereon by a collar 70 and shoulder 71 formed by an enlarged portion of the shaft 45. A shaft 72 is rotatably mounted in bushings 73 and 74 located in concentric transverse bores in the arm portions 41 and 42 respectively of the supporting portion 40 of the head 39, and has a gear wheel 75 keyed thereto at one end which is adapted to mesh with the gear wheel 69 and has a second gear wheel 76 fixed to its other end which is adapted to mesh with the gear wheel 67. Thus, upon rotation of shaft 53, gear wheel 67 and gear wheel 76, shaft 72 and gear wheels 75 and 69 will cause simultaneous rotation of shaft 45 and consequently of the lens 51 carried between the lens engaging pads 46 and 50.

It will be understood that the lens carrying head 38 is mounted on the supporting member 27 and may be adjusted by operating the handle 32 as hereinbefore described, to position the peripheral edge of the lens 51 as desired in the groove formed at the point of adjacency between the beveled abrading wheels 11 and 12.

The lens 51, however, in accordance with this invention is adapted to move arcuately about an axis located at a distance from the lens substantially equal to the radius of the base curve of the lens or of a curve intermediate said base curve and the prescriptive curve as desired. Therefore, there is provided means for pivotally supporting the lens carrying device 38 in the holder 31 (see Fig. 3). This means comprises a substantially U-shaped carrier 77 which is provided with tracks 78 adapted to slide in guideways provided therefor in the head 39. A pair of concentric pivot pins 79 are adjustably located in the opposed upright portions of the holder 31 and are adapted to engage in recesses provided in the carrier, the centers of the pins 79 defining the axis about which the lens carrying device and consequently the lens 51 is moved during an abrading operation, as will be more fully described hereinafter.

To establish the distance between the axis of the pivot pins 79 and the lens 51, it is merely necessary to operate the handle 32 to set the scale and indicator device 37 at the proper reading. As an example, if a lens 51 having a predetermined base curve is to be bevel edged, the holder 31 will be adjusted on the member 27 to a position where the scale and indicator device 37 will register the fact that the axis of the pivot pins 79 is located at a distance substantially equal to the radius of said predetermined base curve from a line passing through the point of adjacency between the abrading wheels 11 and 12 and parallel to the axes of the wheels.

However, since this adjustment alone will generally not result in the lens 51 being properly positioned for edging in the groove, it is necessary to provide a second adjustment to accomplish this. Therefore, there is provided a rotatable shaft 80 (Fig. 3) vertically disposed in the head 39 and having an operating knob 81 at its upper end for manual manipulation by the operator. The lower end of the shaft 80 extends into a longitudinal opening 82 in the lower surface of the head 39 and carries a pinion gear 83 in engagement with a rack 84 secured to the base portion of the carrier 77, a collar 85 adjacent the lower end of the shaft 80 preventing displacement thereof. Upon operation of the knob 81, and subsequent revolving of shaft 80 and pinion gear 83, the head 39 and all the lens supporting mechanism carried thereby will be caused to move longitudinally, the extent of such movement being controlled so that the lens 51 can be positioned as desired in the groove for proper beveling.

An indicator 86 cooperating with the scale 87 on the knob 81 can be used to register this latter adjustment, and after the adjustment has been made means such as a wedge type clamping device 88 on the upper front edge of the head 39 adjacent the edge of the carrier 77 can be employed to render the parts immovable with respect to one another.

The latter adjustment will thus position the lens 51 in abrading position, with the lens 51 being retained therein during the edging operation by gravital force. It will be understood that the lens 51 will be supported by the pads 46 and 50 for rotation substantially about its geometrical or other center to present unbeveled edge portions to the abrading wheels 11 and 12 and that the entire head 39 and related mechanism supported thereon, including the lens 51, will be raised and lowered arcuately about the axis of the pins 79 in accordance with irregularities in the contour shape of the lens. However, in the actual abrading operation the resultant size and shape of the lens 51 will be in accordance with the size and shape of a pattern 89 removably secured to and rotatable with the end of the shaft 45. An edge portion of the pattern 89 is adapted to engage a roller 90 carried by a bracket 91 attached to the side of the base 10 when the corresponding edge portion of the lens 51 has been ground to its final size by the abrading wheels 11 and 12, the pattern 89 being rotatable with the lens 51 by suitable mechanism to present unabraded edge portions of the lens to the abrading wheels, the pattern thus controlling the resultant size and shape of the entire peripheral edge of the lens.

To further control the size of the lens 51, the bracket 91 is vertically adjustable on the base 10. The bracket 91 is adapted to slide in a vertically disposed groove 92 in the base 10 and has a longitudinal slot therein through which the shaft portion 93 of a clamping device is adapted to project, the shaft 93 being threaded into an open-

ing provided therefor in the base 10 and having a fixed knob 94 at its outer end. The bracket 91 is adapted to be adjusted vertically as desired in accordance with readings of a scale 95 thereon as indicated by a pointer 96 adjacent thereto on the base 10, and the knob 94 can be turned to thread the shaft 93 farther into its hole and thus clamp the bracket 91 immovable between the knob 94 and base 10.

Thus, it will be understood that when a lens 51 is supported by a pair of pads 46 and 50 and the axis of the pins 79 located so as to be a distance from the lens 51 substantially equal to the radius of the base curve of the lens, the lens can then be arcuately moved about said axis to a position where its edge will be located in the groove formed at the point of adjacency of the abrading wheels 11 and 12. Then, upon operation of the mechanism to rotate the lens 51, and consequently the pattern 89, the lens edge will be abraded until the pattern 89 contacts the roller 90 and prevents the lens from being drawn farther downwardly by gravity and consequently abraded to a depth greater than desired. Thus, as an irregularly shaped lens is being edged, the head 39 will be moved arcuately about the axis of the pins 79 as various edge portions having different radii from the predetermined center of the lens are presented to the abrading wheels.

As the lens 51 is bevel edged and is raised and lowered arcuately about the axis of the pins 79, the apex of the bevel will be made to substantially parallel the lens surface. However, as the irregular contour edges are beveled, the side surfaces of the bevel will be angled differently with respect to the lens surfaces. Therefore, it is desirable that a condition be reached which is most favorable for producing a bevel to which a lens encircling rim or eye wire can be easily, firmly and efficiently secured. This is accomplished by providing means for additional adjustment of the axis of the pins 79. To provide best results, it has been found that it is desirable to position the axis of the pins 79 at a controlled distance above the plane of the apex of the groove formed by the beveled portions 17a and 18a of the abrading wheels 11 and 12.

Referring to Figs. 4 and 5, an irregularly shaped lens 51 will be supported substantially at its geometrical or other center 97 and will have a maximum radius 98 and a minimum radius 99. The axis 100 of the pins 79, which is positioned away from the lens a distance substantially equal to the radius 101 of the base curve of the lens, is then positioned above the plane 102 of the apex 103 of the groove at a distance indicated by numeral 104 which is substantially equal to one-half the sum of the radii 98 and 99. When a lens is moved into and out of abrading position about an axis so disposed, this will cause a condition to be reached wherein the sides of the bevel will be angled so as to more nearly equal the ideal condition throughout the entire periphery of the lens.

Therefore, in setting up and operating a machine of the character described, it is important that the axis about which the head 39 and lens 51 are to be moved be located in accordance with the shape of the particular lens 51 to be edged. Handle 29 is operated to position this axis above the plane defined by the apex of the groove formed by the abrading wheels, and knob 81 operated to position the axis at a distance from the lens substantially equal to the radius of the base curve of the lens. Then crank 32 can be operated to move the entire head 39, holder 31 and related mechanism to a position where the edge of the lens 51 can be placed in abrading position in the groove formed at the point of adjacency of the abrading wheels 11 and 12.

Then, upon operating the machine as described, the lens 51 can be provided with a bevel edge, the apex of which will be substantially parallel to the surface of the lens and the sides of which will be approximately equiangular with respect to the side surfaces of the lens throughout the entire lens edge.

The bevel, when produced in accordance with the foregoing description, will be shaped to properly receive a rim member or eye wire thereabout without the necessity of bending, reshaping, or otherwise irregularly disposing the member to provide a secure fit with the lens.

From the foregoing description, it will be seen that novel means and method of a simple, efficient and economical nature have been provided for forming beveled edges on articles such as opthalmic lenses in accordance with the objects and advantages of this invention.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the formation and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

I claim:

1. In a device of the character described for edging convexo-concave articles such as lenses and the like, the combination of a base, abrading means mounted on said base for axial rotation, a support mounted on said base to one side of the abrading means and means rendering said support adjustable toward and away from the axis of rotation of said abrading means, a head disposed in overlying relation with respect to said abrading means and including a pivotal portion pivotably connected to the said mentioned support for movement about an axis substantially normal to the axis of rotation of the abrading means, axially rotating supporting means on said head for supporting the article to be edged, and means for adjusting the relative spacing of said supporting means from said axis about which the pivotal portion of the head pivots on said support whereby the article when supported by said supporting means may be positioned at a distance from said pivotal axis equal to approximately the radius of the base curve of said article and in edgewise engagement with said abrading means.

2. In a device of the character described for edging convexo-concave articles such as lenses and the like of non-circular peripheral shape, the combination of a base, abrading means mounted on said base for axial rotation, a first support mounted on said base to one side of the abrading means, a second support mounted on said first support, means rendering one of said supports adjustable in a direction toward and away from the axis of rotation of said abrading means and means rendering the other support adjustable in a direction paralleling said axis, a head disposed in overlying relation with respect to said abrading means and including a pivotal portion pivotably connected to said second support for movement about an axis substantially normal to the axis of rotation of the abrading means, axially rotatable supporting means on said

head by which the article to be edged may be supported in edgewise engagement with said abrading means and with its concave side directed toward said pivotal axis, and means for adjusting the relative spacing of said supporting means from said axis about which the pivotal portion of the head pivots on said second support whereby the axis about which the pivotal portion is connected to pivot may be positioned at a distance from said article, when so positioned, equal to approximately the radius of the base curve of said article and at a distance above the engagement of the article with the abrading means equal to the average of the longest and shortest radii of said article.

3. In a device for bevel edging convexo-concave articles of non-circular contour such as lenses and the like, the combination of a base, a support mounted on said base and means rendering said support adjustable in one direction, and a work supporting member pivotally connected to said support for swinging about an axis disposed approximately normal to the direction of adjustment of said support, said work supporting member carrying a pattern and holding means by which the article to be edged may be mounted in coaxial alignment with the pattern and with its concave side facing said pivotal connection, means for simultaneously axially rotating said pattern and holding means, said axis intersecting the axis of said pivotal connection and paralleling the direction of adjustment of said support, axially rotatable abrading means effectively presenting a V-shaped abrading groove facing in a direction normal to the direction of adjustment of the said support to receive the edge of an article when properly supported by said holding means, a contact carried by said base for engagement by the pattern, and said work supporting means being free to swing about said pivotal connection to permit the article to be edged to substantially the shape of the pattern, and means for adjusting the relative spacing of said holding means to the pivotal connection whereby the pivotal connection of said work supporting member may be located at approximately the center of curvature of the article to be edged.

4. In a device for bevel edging convexo-concave articles of non-circular peripheral contour such as lenses and the like, the combination of a base, a first support mounted on said base and means rendering said support adjustable in one direction, and a second support mounted on said first support and means rendering said second support adjustable in a direction approximately normal to the direction of adjustment of said first support on the base, a work supporting member pivotally connected to said second support for swinging about an axis disposed approximately normal to the directions of adjustment of said two supports, said work supporting member carrying a pattern and holding means by which the article to be edged may be mounted in coaxial alignment with the pattern and with its concave side facing said pivotal connection, means for simultaneously axially rotating said pattern and holding means, said axis intersecting the axis of said pivotal connection and paralleling the direction of adjustment of one of said two supports, axially rotatable abrading means effectively presenting a V-shaped abrading groove facing in a direction paralleling the direction of adjustment of the other of said supports to receive the edge of an article when properly supported by said holding means, a contact carried by said base for engagement by the pattern, and said work supporting means being free to swing about said pivotal connection to permit the article to be edged to substantially the shape of the pattern, and means for adjusting the relative spacing of said holding means to the pivotal connection whereby the pivotal connection of said work supporting member may be located at approximately the center of curvature of the article to be edged.

5. In a device of the character described for forming a beveled edge on convexo-concave articles such as lenses and the like, the combination of a base, a pair of abrading wheels disposed on said base for rotation about parallel axes and in edge-to-edge relation at one area intermediate said axes, said wheels having beveled upper peripheral edges forming a V-shaped groove above said area of edge-to-edge relation, a support mounted on said base to one side of said abrading wheels and means rendering said support adjustable toward and away from the axes of said abrading wheels and the V-shaped groove therebetween, a head disposed in overlying relation with respect to said abrading wheels and including a pivotal portion pivotably connected to said support for movement about an axis substantially normal to the axes of rotation of the abrading wheels, supporting means for supporting the article to be edged, said supporting means being mounted on said head and means permitting adjustment of the relative spacing of said supporting means from said axis about which the pivotal portion of the head pivots on said support whereby the article when supported by said supporting means may be positioned at a distance from said pivotal axis equal to the radius of the base curve of said article and in edgewise engagement with said V-shaped groove formed by the abrading wheels.

6. In a device of the character described for forming a beveled edge on convexo-concave articles such as lenses and the like, a base, a pair of abrading wheels disposed on said base for rotation about parallel axes and in edge-to-edge relation at one area intermediate said axes, said wheels having beveled upper peripheral edges effectively forming a V-shaped groove above said area of edge-to-edge relation, a first support mounted on said base and means rendering said first support adjustable toward and away from the axes of said abrading wheels and the V-shaped groove, a second support mounted on said first support and means rendering said second support adjustable in a direction paralleling the axes of said abrading wheels, a head disposed to overlie said abrading wheels and including a pivotal portion pivotably connected to said second support for movement about an axis disposed substantially normal to the axes of rotation of the abrading wheels and to the directions of adjustments of the two supports, a pattern and work holding means mounted on said head for coaxial rotation about an axis intersecting the axes of said pivotal connection and the axes about which said abrading wheels are rotatable, and a contact carried by said base for engaging the pattern, said work holding means being mounted on said head and means permitting adjustment of the relative spacing of said holding means from said pivotal connection whereby the article when supported by said holding means in edgewise engagement with said V-shaped groove formed by the abrading wheels may be positioned

to swing about approximately its center of curvature in response to rotation of the pattern.

7. A device of the character described for edging convexo-concave articles of non-circular peripheral contour such as lenses and the like comprising a base, abrading means rotatably mounted on said base, a spindle carrying a pattern and holding means by which an article may be supported in edgewise engagement with said abrading means, said spindle being mounted on a head for simultaneous coaxial rotation of the pattern and holding means, and said head being supported on said base and means rendering it free to swing about a pivotal axis disposed approximately normal to and intersecting said axis of rotation of the spindle, a contact carried by said base and engaging the pattern to control the swinging of the work holding means about said pivotal axis during the abrading action of the abrading means on the article when supported by said holding means, and means by which the distance between said pivotal axis and the holding means may be altered.

8. A device of the character described for edging convexo-concave articles of non-circular peripheral contour such as lenses and the like comprising a base, abrading means rotatably mounted on said base, a spindle carrying a pattern and holding means by which an article may be supported in edgewise engagement with said abrading means, said spindle being mounted on a head for simultaneous coaxial rotation of the pattern and holding means, and means supporting said head on said base for free swinging about a pivotal axis disposed approximately normal to and intersecting said axis of rotation of the spindle, a contact carried by said base and engaging the pattern to control the swinging of the work holding means about said pivotal axis during the abrading action of the abrading means on the article when supported by said holding means, and means by which the distance between said pivotal axis and the holding means may be altered, together with additional means by which said pivotal axis may be adjusted in the plane of the swing of said spindle about said pivotal axis and in a direction approximately normal to the axis of rotation of the spindle to alter its location with respect to the abrading action of the abrading means on the article to be edged.

9. A device of the character described for use in edging convexo-concave articles of non-circular peripheral contour comprising a base, abrading means mounted on said base to rotate about a central axis, a head disposed to overlie the abrading means and having means for carrying an article to be edged, an adjustable support carried by said base and located to one side of the abrading means, means mounting said head on said support to swing about an axis substantially normal to the axis about which the abrading means is rotatable to permit the article when supported thereby to be swung toward and away from said abrading means, means rendering said support adjustable in directions both normal to and parallel with the central axis about which the abrading means is rotatable to vary the spaced relation of said axis to the abrading means, and means for altering the separation of said article carrying means of the head from said axis about which the head is swingable to bring the article into position for abrasion by the abrading means whereby the radius of swing may be controlled to approximate that of the curvature of the article being edged.

10. The method of edging a convexo-concave lens of non-circular peripheral shape comprising positioning the lens in edgewise engagement with an abrading surface effectively rotating about an axis disposed substantially parallel to the general plane in which the lens is positioned and maintaining said lens free to pivot about a center located adjacent the center of curvature of the lens and positioned at a distance above the plane of said abrading surface substantially equal to one-half the sum of the longest and shortest distances of the peripheral edge of the lens from its geometrical center.

11. The method of forming a beveled edge on a convexo-concave lens of non-circular peripheral shape comprising rotating a lens while in edgewise engagement with a V-shaped abrading surface effectively rotating about an axis disposed substantially parallel to the general plane of the lens and while maintaining said lens free to swing toward and away from said abrading surface about a center located adjacent the center of curvature of the lens and positioned at a distance above the plane of said abrading surface substantially equal to one-half the sum of the longest and shortest distances of the peripheral edge of the lens from its geometrical center.

12. A device of the character described for edging convexo-concave articles such as lenses and the like comprising a base, abrading means rotatably mounted on said base, a spindle carrying holding means by which an article may be supported in edgewise engagement with said abrading means, said spindle being mounted on a head for axial rotation of the holding means, means supporting said head on said base to swing about a pivotal axis disposed approximately normal to said axis of rotation of the spindle and means by which the distance between said pivotal axis and the holding means may be altered.

13. A device of the character described for edging convexo-concave articles such as lenses and the like comprising a base, abrading means rotatably mounted on said base, a spindle carrying holding means by which an article may be supported in edgewise engagement with said abrading means, said spindle being mounted on a head for axial rotation of the holding means, means supporting said head on said base to swing about a pivotal axis disposed approximately normal to and intersecting said axis of rotation of the spindle, and means by which said pivotal axis may be adjusted in a direction approximately normal to the axis of rotation of said spindle.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
232,721	Hyatt	Sept. 28, 1880
475,068	Temple et al.	May 17, 1982
546,025	McKim et al.	Sept. 10, 1895
760,926	Schroeder	May 24, 1904
1,234,562	Porwska	July 24, 1917
1,489,606	Long	Apr. 8, 1924
1,659,964	Schultz	Feb. 21, 1928
1,794,975	Mershon	Mar. 3, 1931
1,832,190	Doane	Nov. 17, 1931
2,153,275	Schulze	Apr. 4, 1939
2,437,567	Uhlemann	Mar. 9, 1948
2,451,137	White	Oct. 12, 1948