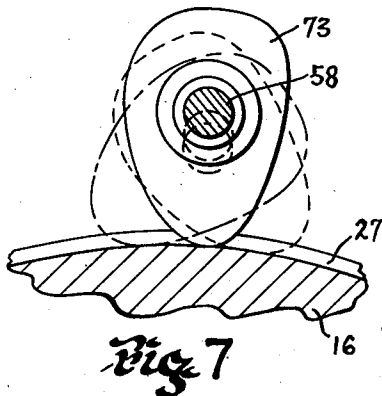
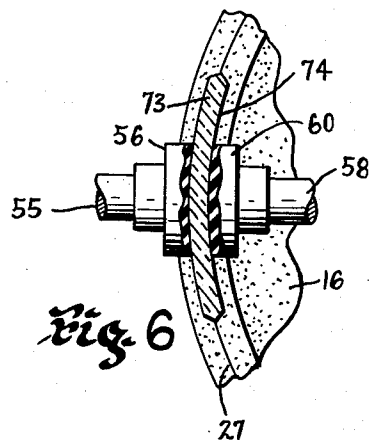
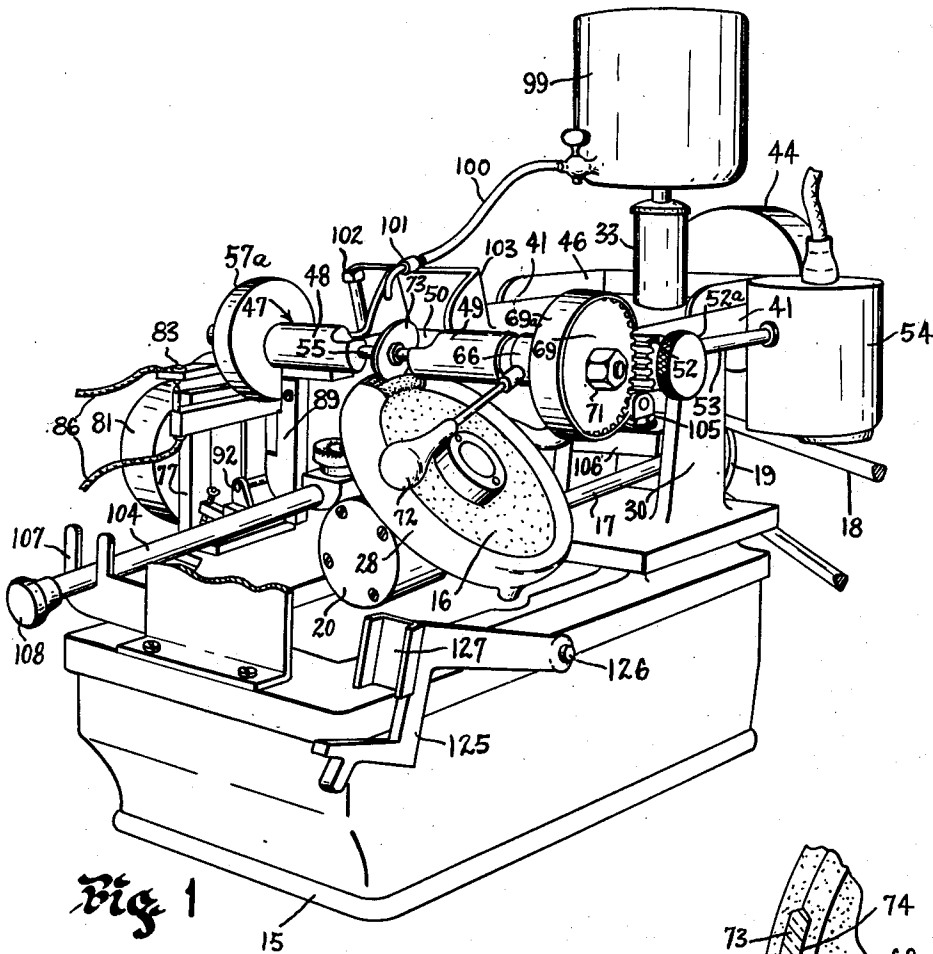


J. R. EVES ET AL
BEVEL EDGING MACHINE

Filed Aug. 20, 1949

4 Sheets-Sheet 1



INVENTORS
JOSEPH ROBERT EVES
OSCAR W. LUNSTROM
BY *Louis A. Vignon*
ATTORNEY

April 6, 1954

J. R. EVES ET AL
BEVEL EDGING MACHINE

2,674,068

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4 Sheets-Sheet 2

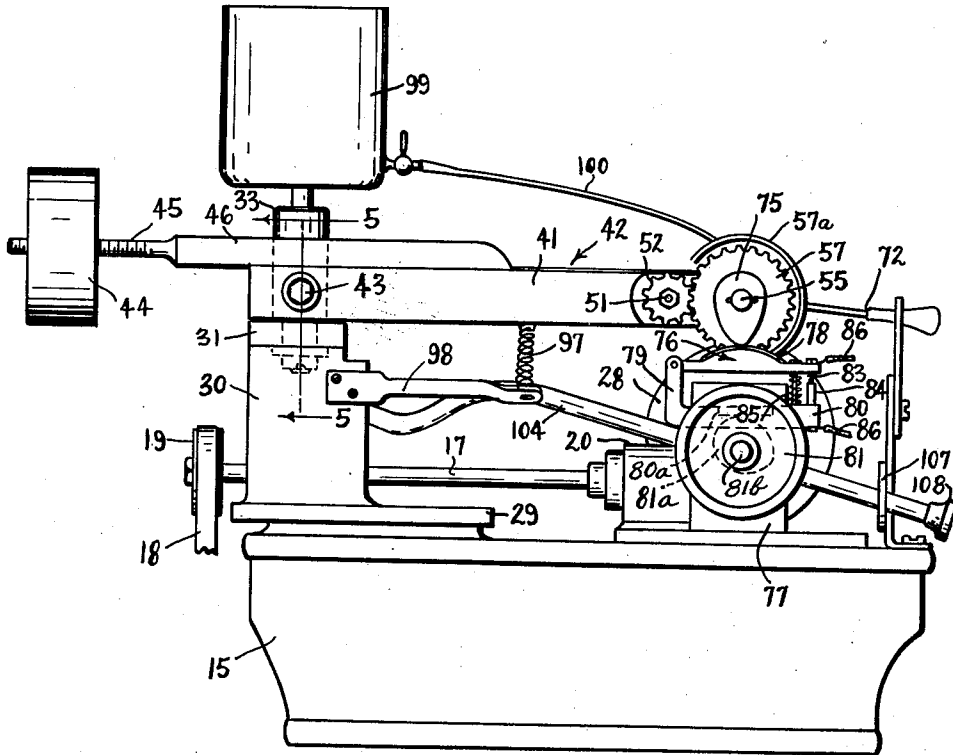


Fig. 2

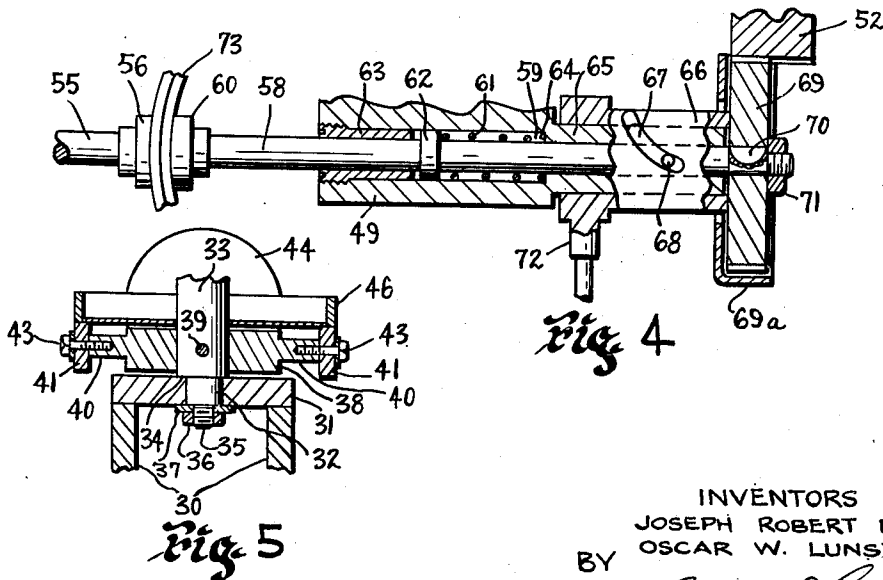


Fig. 4

Fig. 5

INVENTORS
JOSEPH ROBERT EVES
OSCAR W. LUNSTROM
BY

Louis A. Cagnon
ATTORNEY

April 6, 1954

J. R. EVES ET AL
BEVEL EDGING MACHINE

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4 Sheets-Sheet 3

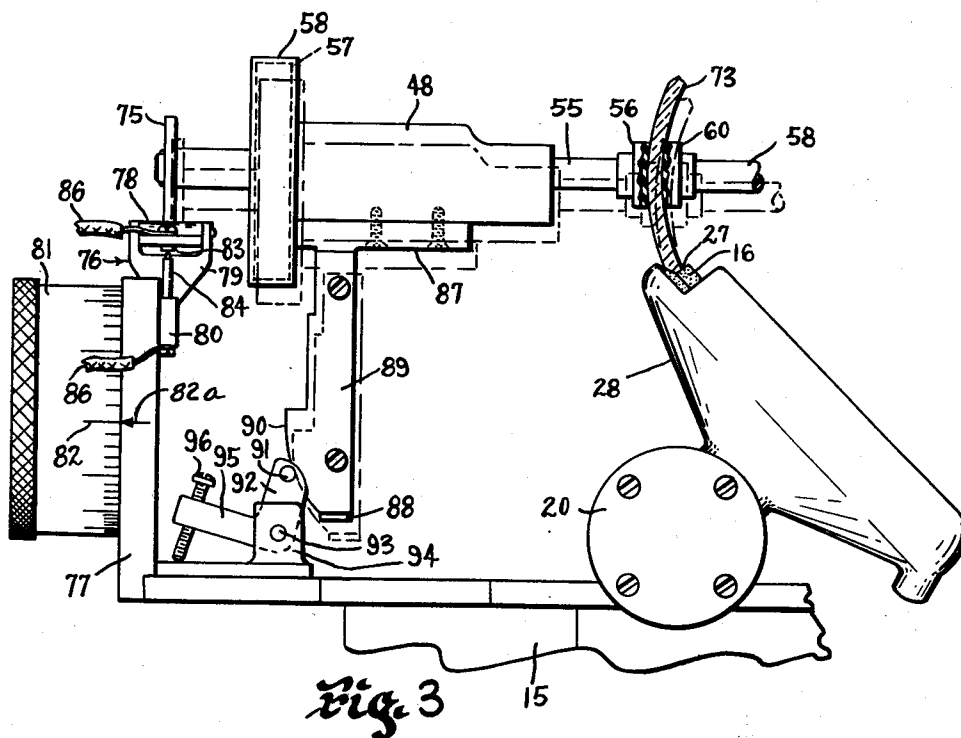


Fig. 3

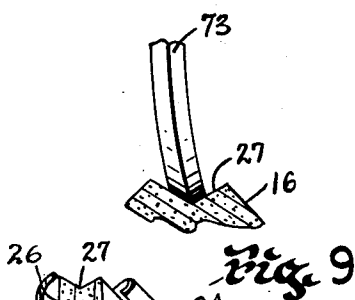


Fig. 9

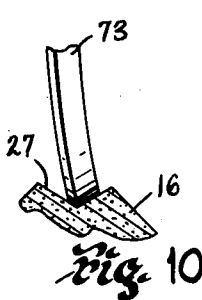


Fig. 10

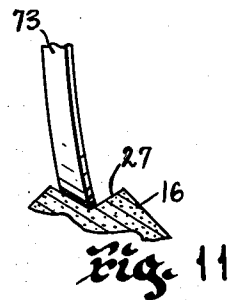


Fig. 11

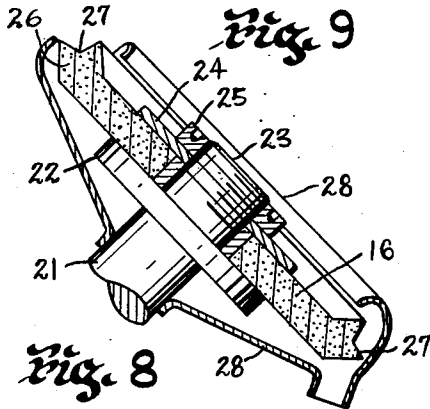


Fig. 8

INVENTORS
JOSEPH ROBERT EVES
OSCAR W. LUNSTROM
BY
Louis H. Lagnon
ATTORNEY

April 6, 1954

J. R. EVES ET AL
BEVEL EDGING MACHINE

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4 Sheets-Sheet 4

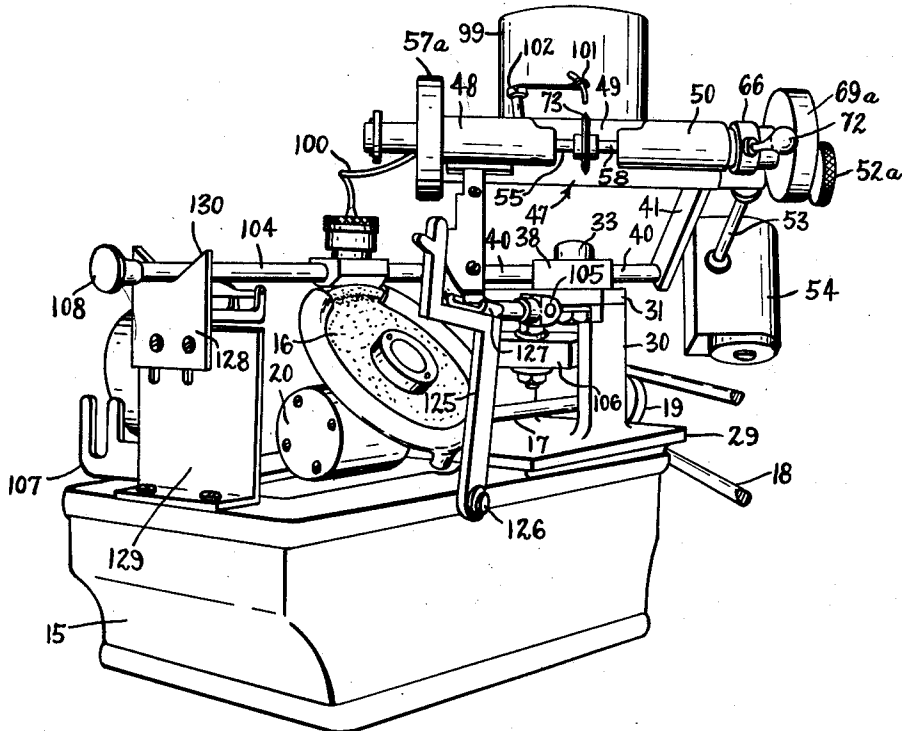


Fig. 12

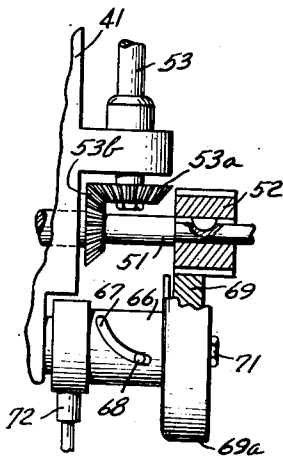


Fig. 14

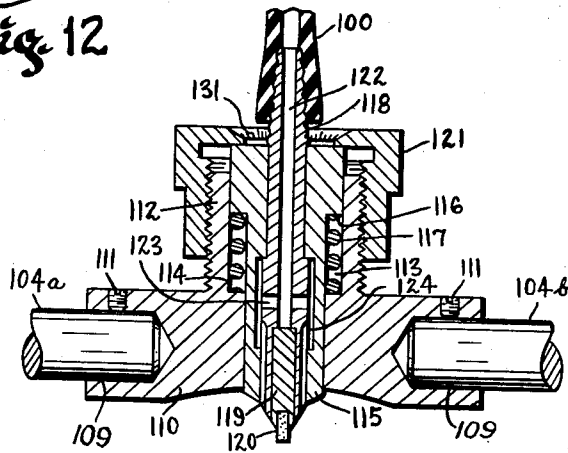


Fig. 13

INVENTORS
JOSEPH ROBERT EVES
OSCAR W. LUNSTROM
BY
Louis A. Lagnon
ATTORNEY

UNITED STATES PATENT OFFICE

2,674,068

BEVEL EDGING MACHINE

Joseph Robert Eves and Oscar W. Lundstrom,
Southbridge, Mass., assignors to American Op-
tical Company, Southbridge, Mass., a voluntary
association of Massachusetts

Application August 20, 1949, Serial No. 111,392

10 Claims. (Cl. 51—101)

1

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

A principal object of the invention is to provide improved means and method of accurately forming beveled edges on articles particularly of meniscus shape and of non-circular contour such as ophthalmic lenses and embodying an inclined abrading wheel rotatable about a central axis and having a V-groove in its effective surface encircling said axis, and means for moving a lens into edgewise engagement with said groove angularly with respect to the axis of the abrading wheel, said V-groove being so curved that when viewed from the top the portion thereof engaged by the lens will be curved substantially in the direction of the general curvature of the lens.

Another important object is to provide improved means of the above character embodying an abrading wheel rotatable about a central axis and having a V-groove in its effective surface encircling said axis, and means for supporting a lens for rotation substantially about a predetermined center and for movement toward and away from said V-groove, with the abrading wheel being angled with respect to the path of movement of the lens into and out of engagement therewith so that said lens may be permitted to contact the curved V-groove substantially at its highest point for abrading thereby.

Another important object is to provide novel means and method wherein the lens, during the edging operation, is moved longitudinally of its axis in accordance with the shape of a cam surface provided for controlling said movement whereby the apex of the bevel throughout its entire length will be accurately located as desired between the respective curved surfaces of the lens.

Another object is to provide novel means and method of forming beveled edges on articles such as ophthalmic lenses having curved front and rear surfaces and irregular contour shapes embodying an abrading wheel rotatable about a central axis and having a V-groove in its effective surface encircling said axis, means for supporting a lens for rotation substantially about a predetermined center and for swinging movement into edgewise engagement with said V-groove for abrading thereby, and control means embodying a cam shaped in accordance with the

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curvature of a selected surface of the particular lens being edged for initially locating the apex of the bevel and for controlling movement of the lens longitudinally of its axis as it is rotated to maintain the apex of the bevel constantly parallel to the peripheral edge of said surface.

Another object is to provide an automatic machine of the above character 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 perspective view of a bevel edging machine embodying the invention;

Fig. 2 is a left side elevation of the same;

Fig. 3 is a fragmentary side elevation of the abrading wheel, lens supporting means, and cam control and size adjusting devices;

Fig. 4 is a fragmentary sectional view of the retractable lens supporting means;

Fig. 5 is a fragmentary sectional view taken on line 5—5 of Fig. 2;

Fig. 6 is a fragmentary top plan view illustrating the position of a lens when in engagement with the abrading wheel;

Fig. 7 is a diagrammatic illustration showing a lens in engagement with the abrading wheel at various points during its rotation;

Fig. 8 is a fragmentary sectional view of one form of abrading wheels suitably shaped in accordance with the invention;

Figs. 9, 10 and 11 are fragmentary sectional views of a lens in engagement with the groove of the abrading wheel illustrating various locations of bevels which can be produced;

Fig. 12 is a perspective view of a machine shown with the wheel dressing device in operative position;

Fig. 13 is a fragmentary sectional view of the dressing device; and

Fig. 14 is a fragmentary view of one end of the work rotating shaft, the drive shaft and the interconnecting gear mechanism.

In the manufacture of ophthalmic mountings the many varied designs necessitate the use of variously shaped lenses many of which are mounted in supporting rims or eyewires. This poses the problem of providing the edges of the lenses with specific shapes whereby the rims or eyewires may be easily fitted around the peripheries of the lenses without deformation and possible consequent inefficiency and detracton from

the attractive appearance desired of the assembled mounting.

The prior art teaches many ways of providing ophthalmic lenses with beveled edges shaped for insertion within V-grooves formed in rim members and it will be understood that with flat lenses such a beveled edge can be easily produced.

However, lenses having curved front and rear surfaces and irregular contour shapes are not easily provided with efficient beveled edges since by most prior art methods the apices of the bevels will be crooked or wavy and thereby necessitate that the rims be deformed from their initial shapes to accommodate the lenses. This undesirable result can be caused by any one of many conditions, important among these being the fact that a lens is supported for rotation substantially about its geometrical center and generally moved along a straight path into the V-groove formed in the edge of a flat abrading wheel for abrasion thereby, said path being generally normal to the axis of the wheel. During rotation of the lens, as edge portions having different distances from the geometrical center of the lens are presented to the groove for beveling these portions will engage at different locations along the groove, and the lens bevel will thus acquire a crooked or wavy apex throughout its length.

Another prior art defect to be overcome in edging lenses having irregular contour shapes and curved surfaces in instances where a flat abrading wheel was used is that known as "error of reach" wherein during the abrading operation an edge portion having a long radius when being abraded will not engage the V-groove in the same manner as an edge portion having a short radius due to the fact that the lens is curved while the vertex of the groove is generally straight. Such conditions will result in the production of lenses having crooked and uneven bevels.

The present invention improves upon the prior art by providing a substantially disc-like abrading wheel rotatable about a central axis and having a V-groove in its effective surface surrounding said axis, the wheel being inclined with respect to the path of movement of a lens into engagement with said groove so that the lens will engage the groove at substantially the highest point thereof, the radius of the groove being computed with the angle of tilt of the wheel so that the groove in the area thereof contacted by the lens will be curved to conform substantially to the general curvature of the lens. Also, there is provided a cam device for controlling the position of the lens supporting means, the cam surface having a radius substantially the same as the radius of curvature of a surface of the lens so that the lens will be provided with a beveled edge, the apex of which will be substantially parallel to the adjacent peripheral edge of said surface 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 having a base 15 upon which is supported an abrading wheel 16. The abrading wheel 16 is adapted to be rotated about a central axis by any suitable conventional power mechanism which may be located adjacent to or within the base 15, such as by employing an electric motor or the like for rotating a shaft 17 through a belt 18 and pulley 19 (Fig. 2) located at one end thereof, the other end being geared to the abrading wheel

16 through bevel gears or the like within a gear box 20.

The abrading wheel 16 is substantially disc-shaped and is disposed at an angle with respect to the surface of the base 15. In the preferred embodiment shown in Fig. 8, the abrading wheel 16 is carried by a shaft 21 having one end connected to the gear mechanism in gear box 20 and has a ringlike retaining seat 22 formed thereon adjacent its other end, and further has a threaded end portion 23 which is adapted to extend through a central opening in the wheel 16, with a washer 24 and nut 25 being used to urge the wheel 16 against the seat 22 so that the wheel will be rotatable with the shaft 21.

It is important to note that the abrading wheel 16 is preferably shaped to have a rim portion 26 therearound in which is formed a V-groove 27, the V-groove 27 encircling the axis of the abrading wheel at a predetermined radius in accordance with the lenses to be edged, as will be more fully described hereinafter.

Other suitable conventional means may be used, however, for securing the abrading wheel 16 to the shaft 21 so that they will be rotatable as a single unit, and the wheel may be partially enclosed by a protecting splash guard 28 to prevent undesirable throwing off of lubricating fluid or coolant by centrifugal force during rotation of the wheel.

Rearwardly of the machine there is provided a supporting plate 29 having fixedly located thereon a pair of spaced uprights 30 connected at their upper ends by a fixed bearing plate 31 (Figs. 2 and 5). A vertical bore is provided centrally of the bearing plate 31 and has rotatably mounted therein an end portion 32 of a vertically extending pivot 33 (see Figs. 1 and 5). The major portion of the pivot 33 is of larger diameter than the end portion 32 so as to provide a circumferential shoulder 34 resting upon the upper surface of the bearing plate 31, and has a threaded lower end portion 35 over which is placed a nut 36 and washer 37 for preventing vertical displacement of the pivot 33.

Fixedly secured to the pivot 33 and rotatable therewith about the axis thereof is a yoke 38, the yoke 38 partially encircling the pivot 33 and spaced slightly above the bearing plate 31 to lessen friction, and being attached to the pivot by suitable means such as a pin 39. The yoke 38 is provided with opposed side portions 40 serving as bearing seats for a pair of spaced arms 41 formed as parts of a head 42. The head 42 is mounted for pivotal movement about a horizontal axis by means of a pair of concentric pivots 43 extending through the arms 41 and secured in the portions 40 of the yoke 38. Thus, since the head 42 is secured by means of the yoke 33 to the pivot 33, it can be rotated horizontally about the axis of the pivot 33 and can also be rotated vertically about the axis of the pivots 43.

The free end of the head 42 normally extends forwardly of the machine into overlying relation to the abrading wheel 16, and has a counterbalance weight 44 suitably adjustably secured to an extension 45 projecting rearwardly from a bracket 46 fixedly secured to the head to partially compensate for the weight of the parts thereof located forwardly of the pivot 33.

The arms 41 of the head 42 extend forwardly of the machine and are connected at their forward ends to a substantially U-shaped lens supporting member 47. The supporting member 47 is conventional and comprises a pair of spaced

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forwardly extending arm portions 48 and 49 and a base portion 50. The base portion 50 has a transversely disposed shaft 51 (Fig. 2) rotatably mounted therein, which shaft 51 has a gear wheel 52 located at each end for rotation therewith. The gear wheels 52 and shaft 51 are adapted to be rotated simultaneously by conventional means such as additional gearing shown in Fig. 14 wherein bevel gear 53b is shown as carried by shaft 51 and meshing with gear 53a on shaft 53 which is operated in response to rotation of the shaft 53 by a suitable motor 54 (Fig. 1) carried by one of the arms 41.

The arm portion 48 of the supporting member 47 has rotatably mounted therein a lens supporting shaft 55 (Fig. 3) one end of which extends into the space between the arm portions 48 and 49 and carries a resilient lens engaging pad 56 thereon. A gear wheel 57 fixed to the shaft 55 adjacent its other end is in mesh with the adjacent gear wheel 52 carried by the shaft 51 (Fig. 2) and is covered by a suitable guard 57a.

The opposed arm portion 49 carries a retractable shaft 58 therein (Fig. 4) coaxial with the shaft 55. The shaft 58 extends through a transverse bore 59 in the arm portion 49, with one end extending toward the adjacent end of the shaft 55 and carrying a resilient lens engaging pad 60 similar to the pad 56 on shaft 55. The inner end of the bore 59 is enlarged to provide space for a coiled tension spring 61 to be inserted therein over the shaft 58. The shaft 58 is provided with an enlarged portion 62 for engagement by one end of the spring 61 and a retainer 63 is threaded into the end of the bore 59 over the shaft 58 to prevent displacement of the parts of the device. The other end of the spring 61 engages the shoulder 64 formed by the reduced portion of the bore 59 and thereby constantly tends to urge the shaft 58 toward the shaft 55.

The outer side of the arm portion 49 is provided with an extension 65 having a collar 66 rotatably mounted thereover. The collar 66 has a slot 67 extending angularly therein (Fig. 4) into which is extended a pin member 68 fixedly secured to the extension 65. A gear wheel 69 is fixed to the outer end of the shaft 58 adjacent the collar 66 as by a key 70, and held thereon by a nut 71. The gear wheel 69 is operatively adapted to mesh with the adjacent gear wheel 52 and has a guard 69a suitably mounted thereover on the shaft 51. Upon operation of a handle 72 attached to the collar 66, the collar 66 can be made to rotate about the extension 65 within the limits allowed by the pin and slot arrangement 67-68, which movement will cause the gear wheel 69 to be moved in a direction away from the extension 65, causing the shaft 58 to be simultaneously moved longitudinally of the bore 59 to space the lens engaging pads 56 and 60 sufficiently to permit a lens 73 to be inserted therebetween. Upon release of the handle the spring 61 will act to return the parts to their normal positions with the pads 56 and 60 firmly engaging the opposed side surfaces of the lens 73.

In positioning a lens 73 in the supporting member 47 it is important that the major meridians of the lens are located in proper axial position and that the lens is placed so that its predetermined center is located substantially concentric with the shafts 55 and 58. Thus, upon operation of the motor 54 to cause rotation of shaft 53, the gear wheels 52 and shaft 51 will cause simultaneous rotation of gear wheels 57 and 69 and consequently of the shafts 55 and

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58 and lens 73. A knob or hand wheel 52a is attached to the gear wheel 52, however, so that the head may be operated by hand if desired.

When a lens 73 is properly supported and the head 42 positioned as shown in Fig. 1, the edge of the lens 73 will be positioned in the V-groove 27 of the abrading wheel 16. However, in order that the lens 73 will engage the V-groove 27 properly it is important that the lens be supported in such a manner that its rear surface 74 (Fig. 6) be directed toward the axis of the abrading wheel 16. That is, in the present construction, with the wheel 16 inclined as shown in Fig. 1 and with the lens 73 contacting the wheel at substantially the highest point of the V-groove 27, the rear lens surface 74 will be in engagement with the pad 60 on shaft 58. This will position the lens 73 so that the general curvature thereof will follow substantially the curve of the upper portion of the V-groove as seen from above (Fig. 6).

It will be understood that as seen from above the V-groove in the inclined abrading wheel 16 will appear elliptical. Therefore, when grooving the wheel it is obvious that the radius thereof from the axis of the wheel and the angle of tilt must be computed so that the resultant groove in the area to be engaged by the lens will be curved to conform substantially to the general curvature of the lens.

When a lens 73 is positioned with an edge portion thereof in engagement with the V-groove 27 for abrading, the abrading wheel 16 is rotated about its axis. This will cause the lens to be abraded by the wheel in accordance with the shape of a pattern 75 fixedly carried by the outer end of the lens supporting shaft 55. The pattern 75 is rotatable with the lens 73 and is shaped in accordance with the desired shape of the resultant lens.

As the lens edge is being abraded the lens 73 and head 42 will move downwardly about the axis of the pivots 43 and when the portion of the lens in engagement with the abrading wheel 16 has been abraded to the desired depth the pattern 75 will engage an adjustable stop device 76 carried by a bracket 77 mounted on the base 15.

The stop device 76 in the preferred form comprises an arcuately shaped shoe 78 which is pivoted at one end to an angled supporting member 79 (Figs. 2 and 3) carried by an insulating member 80 on the bracket 77.

The shoe 78 is formed of suitable insulating material and carries a contact 83 at its free end which is adapted to be positioned adjacent a contact 84 carried by the insulating member 80. A spring device 85 is used to maintain the contacts 83 and 84, through suitable wiring 86, are positioned in the circuit for energizing and de-energizing the motor 54 which controls the rotation of the lens.

Thus, when the pattern 75 engages the shoe 78 with sufficient force, as results when that portion of the lens engaging the abrading wheel has been ground to finished depth, this causes the contacts 83 and 84 to become engaged. This will close the circuit to and thereby energize the motor 54 to cause the lens to be rotated sufficiently to present the next adjacent edge portion thereof to be beveled by the V-groove 27 of the abrading wheel 16. This portion, prior to receiving its bevel, will cause the pattern to be moved in a direction away from the shoe 78 and thereby release the engagement of contacts

83 and 84 breaking the circuit to the motor 54, which will not be operated again until the newly presented unbeveled edge portion of the lens has been abraded to the desired depth. This operation is progressively and automatically repeated until the entire edge is beveled.

A hand wheel 81 is used to raise or lower the stop device 76 by conventional mechanism such as a cam 81a mounted on a shaft 81b of said hand wheel 81, said cam engaging with a portion 80a of said insulating member 80 to adjust the stop device and control the resultant size of the lens 73. A scale 82 on the hand wheel 81 is adapted to be aligned with an indicator 82a on the bracket 77 to visually indicate the size adjustment.

It is to be understood, however, that if contacts 83 and 84 are dispensed with and/or wiring 86 directly connected together, a continuous rotation of the lens 73 during the edging process will be had, if desired, rather than the intermittent method described above. The advantage of using contacts 83 and 84 in the intermittent method described is that the lens is ground in one revolution rather than in many.

As a lens 73 having an irregular contour shape is rotated during the edging operation, the head 42 will move slightly upwardly and downwardly about the axis of the pivots 43 in accordance with the varying distances of the edge portions of the lens from the center about which the lens is rotated. In order to control the position of the apex of the bevel with respect to the edge of a selected side surface of the lens there is provided a cam arrangement for controlling the position of the lens in the V-groove.

This cam arrangement comprises a supporting bar 37 attached to the under side of the lens supporting member 47 (Fig. 3) and having attached to or formed integral therewith a depending cam carrying member 88. The cam carrying member 88 has secured thereto a template 89 having a cam surface 90 formed thereon. The cam surface 90 is of specific shape and is preferably formed to a radius corresponding substantially to the radius of curvature of the selected side surface shape of the lens 73 to be edged.

The cam surface 90, during operation of the machine, is in engagement with a roller 91 carried by the opposed arms of an adjustable stop 92, the stop 92 being pivotally connected at 93 to a bracket 94 carried by the base 15 and having an end portion 95 carrying an adjusting screw 96 for moving the stop 92 about the pivot 93 in adjusting the device for the desired engagement by the cam surface 90. A coiled spring 97 having one end attached to one of the arms 41 of the head 42 (Fig. 2), and having its other end secured to a member 98 suitably carried by a fixed portion of the machine such as one of the stands 30, acts to constantly urge the head 42 in a direction to maintain the cam surface 90 in continuous engagement with the stop 92.

If it is desired to locate the apex of the bevel substantially centrally of the peripheral edge of the lens 73 as shown in Fig. 9 the stop 92 will be adjusted so that when the cam surface 90 is in engagement therewith the lens edge will be located to substantially evenly engage the opposed sides of the bevel 27. As the machine is operated in the manner hereinbefore described, the rise and fall of the head 42 about the pivots 43 as the lens 73 is rotated will cause different areas of the cam surface 90 to engage the stop

92. This, due to the fact that the cam surface 90 is curved, will cause a consequent pivotal movement of the head 42 about the pivot 33 as shown by dot and dash lines in Fig. 3. This movement will compensate for varying edge distances from the center of rotation of the lens during the beveling thereof to maintain the position of the lens 73 substantially uniformly in the V-groove 27 of the abrading wheel 16 so that the apex of the bevel will at all times be substantially parallel to the adjacent peripheral edge of a selected surface of the lens 73, this surface, being in most instances, a spherical surface.

This feature is important in the manufacture of lenses for use in articles such as ophthalmic mountings since it is sometimes desired to provide rims or eyewires encircling the lenses, with the rims being spaced substantially equally from all points of the front peripheral edge of the lens for desirable cosmetic effect, particularly when said front surface is spherical. By providing a bevel a uniform distance from the front surface of the lens, in accordance with the foregoing description, the rim members will be spaced uniformly from said surface and will not require excessive bending or adjusting to fit them over the lenses. Also, since the stop 92 is adjustable, the lens 73 can be positioned in various manners in the V-groove 27 of the abrading wheel 16 to space the apex of the bevel at various desired distances from the edge of the front or rear surface of the lens, as desired, as illustrated in Figs. 10 and 11.

In some instances, however, it may be advisable to disconnect the cam device and permit gravitational force to maintain the lens edge in the groove. This will produce a bevel having its apex centered with respect to the peripheral edge of the lens.

The machine illustrated is provided with the conventional container 99 in which a suitable coolant or lubricating fluid is placed and is adapted to flow therefrom through a tube 100 onto the lens 73 and abrading wheel 16 during the abrading operation. The tube 100 is detachably secured to a nozzle 101 suitably carried as by a stud 102 so that the stream of fluid will be directed as desired. A splash guard 103 is also provided to prevent excessive and undesirable splashing of the fluid onto other parts of the machine. It is to be understood, however, that other means may be used for conveying the fluid to the lens and abrading wheel if desired.

Since the V-groove 27 in the abrading wheel 16 is subject to wear it is desirable to provide means for simply and efficiently maintaining the desired shape thereof. Therefore, there is provided a wheel dressing device comprising an elongated supporting arm 104 extending longitudinally of the machine and having its rearward end pivoted for universal movement by a conventional universal connection 105 to a fixed support 106 carried between the stands 30 (see Fig. 12). The arm 104 has its forward end portion normally reposing in a suitable holder 107 provided therefor at the front of the machine and has a knob 108 or other suitable gripping means secured to the end thereof.

The arm 104 is formed in two sections 104a and 104b (see Fig. 13) the adjacent ends of which reside in bores 109 provided therefor in a block 110 carried by the arm 104, the arm sections 104a and 104b being retained in position by set screws or similar means 111.

The block 110 is shaped to have an upwardly extending portion 112 with a vertical bore 113 being provided therein and extending through the

entire block 110, the portion of the bore 113 within the block portion 112, however, being of larger diameter than the lower end of the bore so as to form a shoulder 114 therein. A vertically slidable member 115 is located in the bore 113 and has an enlarged upper end portion forming a shoulder 116 against which one end of a coiled tension spring 117 abuts, the other end of the spring 117 resting upon the shoulder 114. Thus, the spring 117 constantly urges the member 115 upwardly.

A diamond holding member 118 is press fitted within a longitudinal bore in the slidable member 115 and is movable therewith, and has a fluted lower end portion projecting below the block 110, with one end of a diamond holder 119 being inserted therein and carrying a diamond at its other end. A cap 121 is threadably mounted over the upwardly extending portion 112 of the block 110 and has an opening through which the upper end of the diamond holding member 118 extends, this permits the top of the cap 121 to bear directly upon the upper end of the slidable member 115. By adjusting the cap 121 on the block portion 112 the member 115 can be adjusted vertically in the bore 113. The member 118 is bored longitudinally to form a conduit 122 for a liquid and has a series of transverse openings 123 communicating with the bore 122 to permit liquid to pass from the bore 122 to the opening 123 and thence into an enlarged portion 124 of the bore in the slidable member 115, from which the liquid can pass by way of the flutes in the holding member 118 to the diamond.

To permit the fluid in the container 99 to be used in the wheel dressing operation, the tube 100 can be disconnected from the nozzle 101 and attached to the end of the diamond holding member 118 (Fig. 13). Thus, fluid will flow from the container 99, through tube 100, bore 122, openings 123, bore portion 124 and flutes, and will thus surround the diamond. The diamond, in the direction of the groove in the abrading wheel, is provided with a wedge shaped cross section which is such as to form the desired V-groove in the wheel.

In dressing an abrading wheel 16, the entire head 42 and attached lens supporting mechanism is swung upwardly about the pivots 43 and sideways about pivot 33 to a position where it can be supported by means such as a bracket 125 pivoted at 126 to the side of the base (Fig. 12). The bracket 125 is normally in the inoperative position shown in Fig. 1. However, when it is desired to dress the wheel, the bracket 125 is moved upwardly about the pivot 126, and the head 42 positioned so that the end of the cam carrying member 88 rests on a shelf 127 provided therefor on the bracket 125.

This will hold the head 42 out of the way so that the arm 104 of the dressing device may be raised to position the diamond 120 in the V-groove 27 of the abrading wheel 16, with the tube 100 connected to the dressing device to permit fluid to flow to the diamond, the abrading wheel 16 is caused to rotate and the diamond 120 will reshape the V-groove 27.

The shape of the groove 27 can be controlled by a template 128 (Fig. 12), adjustably mounted on a bracket 129 secured to the base 15. The template has a notch 130 formed in its upper edge, the notch 130 being shaped substantially to the shape desired of the V-groove 27. The arm 104 is adapted to rest in the notch 130 when the diamond 120 is in the V-groove 27. Thus, upon moving the arm 104 along the opposed surfaces of

the notch 130 the diamond 120 will be made to move correspondingly to shape the V-groove.

To adjust the diamond 120 to compensate for wear of the abrading wheel 16 the cap 121 is rotated and the adjustment indicated by a scale 131 marked thereon. When the diamond 120 has been moved to the limit of adjustment by the cap 121, further adjustment can be made by moving the template 128 up or down on the bracket 129.

By this means the V-groove 27 can be easily and efficiently maintained in the desired shape to produce the desired bevel on the edges of lenses, and the bevel, when produced in accordance with the foregoing description, will be properly located and shaped to receive a rim member or eyewire therearound without the necessity of bending, reshaping or otherwise irregularly disposing the member to provide a secure fit with the lens.

From the foregoing 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 ophthalmic 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.

We claim:

1. An edging device of the character described for forming a beveled edge on articles such as lenses comprising abrading means rotatable about its own axis and having an abrading surface of approximately V-shape section surrounding said axis, rotatable supporting means for holding the work in edgewise engagement with said abrading surface during rotation of the abrading means, said work when properly supported having a predetermined center substantially coinciding with the axis of rotation of the work supporting means and said means having said axis about which it rotates angularly disposed to said axis about which the abrading means is rotatable, said abrading surface of the abrading means being so disposed that a bisector of said approximately V-shape section when located in the plane defined by said two axes will intersect the axis of said abrading means at an angle other than normal thereto and will be approximately normal to said axis about which the work is to be rotated.

2. An edging device of the character described for forming a beveled edge on articles such as lenses comprising abrading means rotatable about its own axis and having an abrading surface of approximately V-shape section surrounding said axis, supporting means for holding the work in edgewise engagement with said abrading surface during rotation of the abrading means, and means for rotating said supporting means about an axis angularly disposed to said axis about which the abrading means is rotatable whereby the work when coaxially supported thereby will be simultaneously axially rotated, said abrading surface of the abrading means being so disposed that a bisector of said approximately V-shape section when located in the plane defined by said two axes will intersect the axis of said abrading means at an angle other than normal thereto and will be approximately normal to said axis about which

the supporting means for the work is to be rotated, together with cam means cooperatively associated with said supporting means for moving it in a direction longitudinally of said axis about which the work when supported thereby is to be rotated.

3. An edging device of the character described for beveling the edge of articles such as lenses, said device comprising an abrading wheel rotatable about a fixed axis, and having a peripherally disposed abrading surface, a supporting member having means for supporting the work in edgewise engagement with said abrading surface and said means being mounted for rotation about a second axis disposed at an angle to said axis about which the abrading wheel is rotated, said work when properly supported by said means having a predetermined center substantially coaxial with the axis about which said means rotates, said supporting member being mounted for movement about a pair of pivots spaced rearwardly of the plane defined by said axes of the abrading wheel and the work supporting means and in substantially parallel relation thereto, one of said pivots being disposed approximately normal to the axis of rotation of the work supporting means to permit the work when carried thereby to be moved in a direction transversely of the adjacent portion of the abrading surface of the abrading wheel, and the other pivot being disposed approximately normal to said first pivot to permit the work when so carried to be moved in a direction toward and away from said abrading surface, and a pair of cam means controlling the pivoting of said supporting member about said pivots and the consequent edging action of the abrading wheel on said work.

4. An edging device of the character described for beveling the edge of articles such as lenses, said device comprising an abrading wheel rotatable about a fixed axis and having a peripherally disposed abrading surface encircling said axis, a supporting member having means for supporting the work with a predetermined center thereof coaxial therewith and in edgewise engagement with said abrading surface, said means being mounted for rotation about a second axis disposed at an angle to said axis about which the abrading wheel is rotated to simultaneously rotate the work about its axis when so supported, said abrading surface being so disposed that a bisector thereof when located in the plane defined by the said two axes will intersect the axis of the abrading means at an angle other than normal thereto and will be approximately normal to said axis of rotation of the work supporting means, said supporting member being mounted for movement about a pair of pivots spaced rearwardly of said plane defined by the axes of the abrading wheel and the work supporting means and in substantially parallel relation thereto, one of said pivots being disposed approximately normal to the axis of rotation of the work supporting means to permit the work when carried thereby to be moved in a direction transversely of the adjacent portion of the abrading surface of the abrading wheel, and the other pivot being disposed approximately normal to said first pivot to permit the work when so carried to be moved in a direction toward and away from said abrading surface.

5. In a device of the character described for forming beveled edges on articles having curved front and rear surfaces and irregular contour shapes, the combination of a base, an abrading wheel on said base rotatable about a central axis

and having an effective surface in the form of a groove encircling said axis, a head carrying axially rotatable article supporting means, said supporting means including portions for holding the article in edgewise engagement with said groove, the axes of rotation of said abrading wheel and article supporting means being inclined to each other so that said groove, when viewed from above, having in the general area of engagement by said article a radius of curvature closely approaching the radius of curvature of the article and being curved in the direction of curvature of the article, universal connection means connecting said head to said base at a location remote from said supporting means and control means for maintaining the edge of the article in the desired position of engagement with said groove during rotation thereof about said predetermined axis comprising a cam member having an effective surface shaped to a desired curvature, and a shoe member adapted to be engaged by said surface of the cam, one of said members being carried by the supporting means and the other by the base for causing movement of the supporting means and article in a direction longitudinally of said axis of rotation of the supporting means and transversely of said groove, said surface of the cam member being so shaped as to maintain the apex of the bevel formed thereon throughout its length at a desired position intermediate the edges of the front and rear surfaces of the article.

6. In a device of the character described for forming beveled edges on articles having curved front and rear surfaces and irregular contour shapes, the combination of a base, an abrading wheel on said base rotatable about a central axis and having an effective surface in the form of a groove encircling said axis, axially rotating supporting means on said base for carrying an article in edgewise engagement with said groove, said axis of rotation of the abrading element being angled with respect to the axis of rotation of the article supporting means with the edge of said article when properly supported by said supporting means engaging the groove in the abrading wheel in an area adjacent its highest point, said groove when viewed from above having in the general area of engagement by said article a radius of curvature closely approaching the radius of curvature of the article and being curved in the direction of curvature of the article, universal connection means connecting said supporting means to said base, and control means for maintaining the edge of the article in the desired position of engagement with said groove during rotation thereof about said predetermined axis comprising a cam member connected to said supporting means and having an effective surface shaped to a desired curvature, and a shoe carried by said base and engaged by said surface of the cam for causing movement of the supporting means and article in a direction longitudinally of the axis of rotation of the abrading means and transversely of said groove for maintaining the apex of the bevel formed thereon throughout its length at a desired position intermediate the edges of the front and rear surfaces of the article.

7. In a device of the character described for forming beveled edges on articles having curved front and rear surfaces and irregular contour shapes, the combination of a base, an abrading wheel on said base rotatable about a central axis and having an effective surface in the form of a groove encircling said axis, axially rotating sup-

porting means on said base for carrying an article in edgewise engagement with said groove, said axis of rotation of the abrading element being angled with respect to the axis of rotation of the supporting means with the edge of said article when properly supported by the supporting means engaging the groove in the abrading wheel in an area adjacent its highest point, said groove being spaced at a predetermined radius from the axis of the abrading wheel so that in vertical projection the radius in the general area engaged by the article will substantially approach the general curvature of the article, universal connection means connecting said supporting means to said base, and control means for maintaining the edge of the article in the desired position of engagement with said groove during rotation thereof about said predetermined axis comprising a cam member having an effective surface shaped to a desired curvature, and a shoe member adapted to be engaged by said surface of the cam member, one of said members being carried by the base and the other by the supporting means for causing movement of the supporting means and article in a direction transversely of said groove for maintaining the apex of the bevel formed thereon throughout its length at a desired position intermediate the edges of the front and rear surfaces of the article.

8. A device of the character described for forming a beveled edge on an article having curved front and rear surfaces and an irregular contour shape comprising a base, an abrading wheel on said base rotatable about a central axis and having an effective abrading surface in the form of a groove encircling said axis, supporting means on said base for carrying an article for rotation about a horizontal axis and in edgewise engagement with said groove, the axis of rotation of said abrading element being angled with respect to the axis of rotation of the supporting means, and located beneath said axis in alignment therewith to cause the edge of said article when properly positioned in the supporting means to engage the groove in the abrading wheel in an area adjacent its highest point, said groove being spaced at a predetermined radius from the axis of the abrading wheel so that in vertical projection the radius in the general area engaged by the article will closely approach the general curvature of the article and be curved in the direction of curvature of the article, and cam control means for maintaining the article in desired edgewise engagement with the groove comprising a cam member shaped to a desired curvature and a shoe member adapted to be engaged by said cam member, one of said members being carried by the base and the other by the supporting means, and vertically disposed pivot means disposed rearwardly of the axis about which the article is to be rotated about which the supporting means is movable in directions longitudinally of its axis of rotation as various points on the cam surface are brought into engagement with the shoe during rotation of the article about said horizontal axis.

9. The method of edge beveling lenses comprising the steps of axially rotating an abrading wheel having an effective surface in the form of a groove equidistantly spaced about its axis and a lens having edge contact with said groove, said abrading wheel and lens being positioned with their axes so intersecting each other that effectively any point on said groove

follows the general curvature of the lens, and simultaneously moving the lens in the direction of its axis amounts in accordance with the extent of its cupping whereby the apex of the resultant beveled edge will substantially parallel the cupping of said lens.

10. A device of the character described for edging meniscus-shaped articles such as lenses and the like, said device comprising an abrading wheel rotatable about a fixed axis, and having a peripherally disposed substantially V-shaped abrading surface, a supporting member having means for supporting the articles in edgewise engagement with said V-shaped surface and said means being mounted for rotation about a second axis disposed at an angle to said fixed axis about which the abrading wheel is rotated whereby the plane defined by the base of the V-shaped groove is angularly disposed with respect to said second axis to cause the V-shaped surface to be effectively curved in the direction of the curvature of the meniscus-shaped articles to be edged, said articles, when properly supported by said means, having a predetermined center substantially coaxial with the axis about which said means rotates, and said supporting member being mounted for simultaneous movement in right angular directions with respect to each other, one of said directions being disposed approximately in the direction of the axis of rotation of the article supporting means to permit the articles when carried thereby to be moved in a direction transversely of the adjacent portion of the abrading surface of the abrading wheel, and the other direction of movement of said supporting member permitting the work to be moved by the supporting member in a direction toward and away from said abrading surface and means controlling the movement of said supporting member in said directions and the consequent edging action of the abrading wheel on said meniscus-shaped articles.

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