

June 12, 1945.

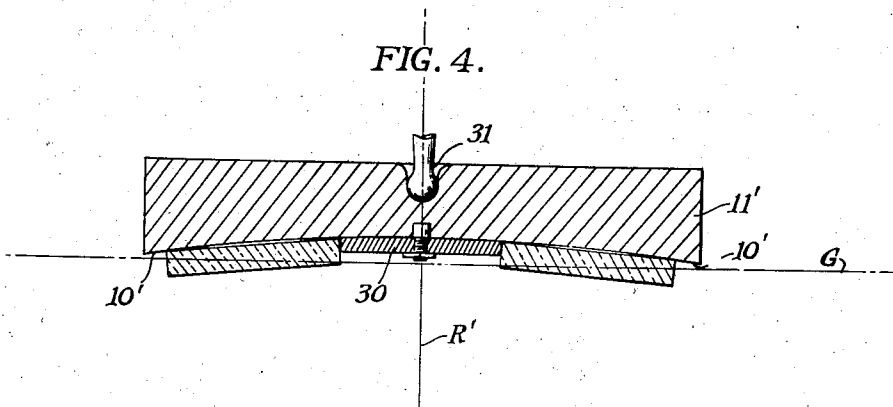
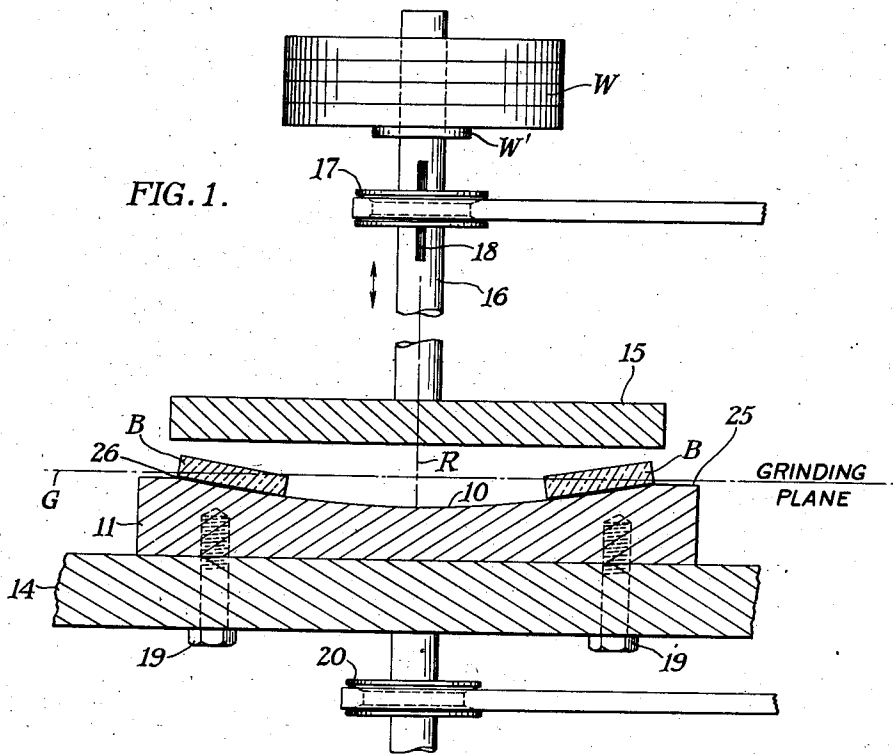
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2,378,243

METHOD AND APPARATUS FOR GRINDING AND POLISHING WEDGES

Filed Aug. 3, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 2.

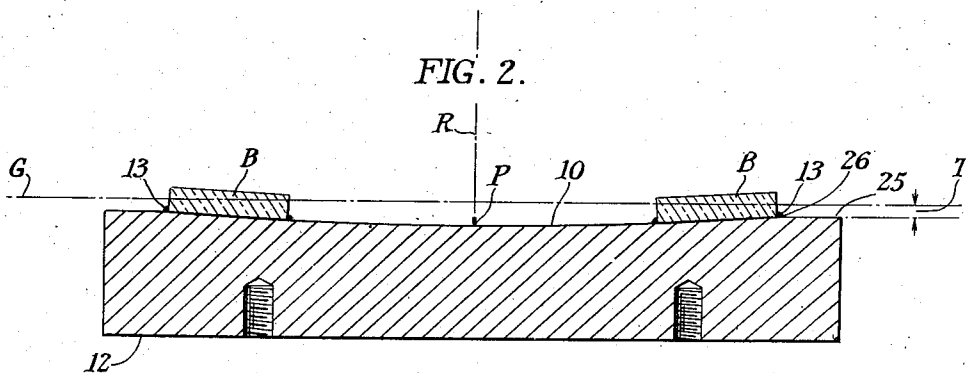
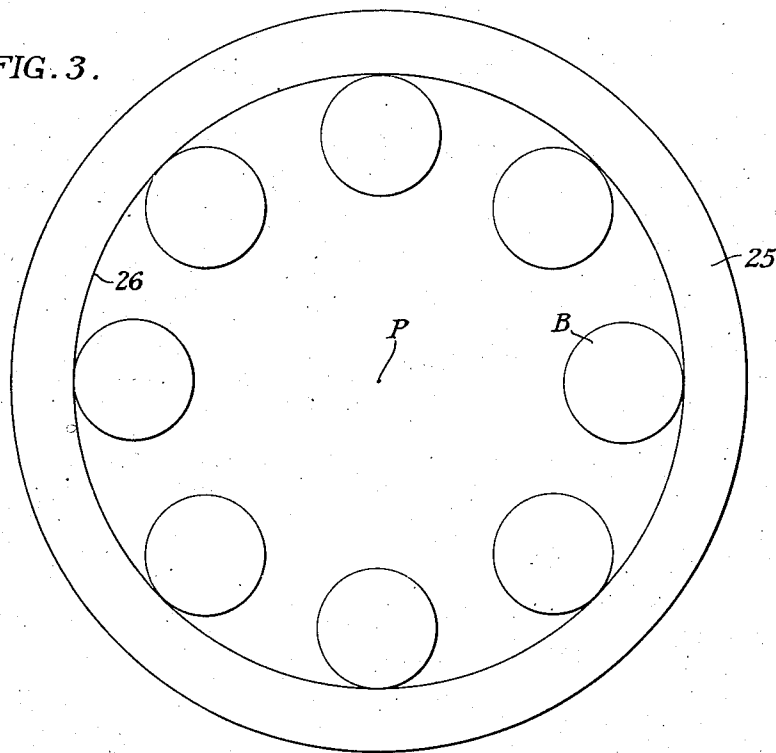


FIG. 3.



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METHOD AND APPARATUS FOR GRINDING
AND POLISHING WEDGES

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The present invention relates to grinding and polishing wedges, and particularly to a method of grinding wedges which greatly speeds up the manufacture of wedges and permits extreme accuracy in the wedge angle to be attained.

In the past, the manufacture of wedges having a precise wedge angle has entailed a great amount of hand work by experts. This is particularly true in the manufacture of optical wedges where the tolerance in wedge angle is specified in seconds of arc. Known procedures involve mounting one or more wedge blanks on a block, and after the blanks are roughly ground approximately to the desired angle, the operation is entirely a hand operation, the operator pressing the work to the grinding wheel, measuring the angle, again pressing the work to the wheel and applying pressure at the desired point indicated as high in the previous measurement, etc., until the wedges are complete. It is difficult to obtain one wedge, having a precise angle, by this procedure; but the problem of obtaining a plurality of wedges having angles within a tolerance of a few seconds of arc is almost impossible on a commercial scale.

One object of the present invention is the provision of a method and apparatus by the use of which hand operation in the manufacture of wedges is eliminated, or reduced to a minimum, and as the result of which more wedges can be manufactured in a given time without the supervision of skilled operators.

Another object is to provide a method and apparatus by which the actual manufacture of wedges is essentially a machine operation, but by means of which the strictest tolerances can be maintained in the wedge angle.

And another object of the present invention is the provision of a method and apparatus by the use of which a plurality of wedges can be ground simultaneously to have equal or unequal wedge angles, as desired, the control of the wedge angle being automatic and being based on a novel method of setting up the work prior to grinding.

And a further object is to provide a method and apparatus for setting up the work prior to grinding which permits small adjustments in wedge angle to be made by comparatively large adjustments of the work on the blocking body.

And yet another object is the provision of a method and apparatus which makes use of a blocking body of such a nature that a number of different wedge angles can be obtained by the use of such body merely by shifting the location of the work thereon.

And a further object is to provide a method of grinding wedges which includes the step of rendering one face of one or more blanks of work plano; mounting the blank, or blanks, on a spherical concave surface with the plano face engaging said concave surface and with the center of the blank, or blanks, to one side of a radial line to said surface; and grinding the exposed surface of the blank, or blanks, until a desired area of each thereof is plano and lies in a plane perpendicular to said radial line.

And another object is to provide a novel apparatus for carrying out the novel method above set forth.

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

Fig. 1 is a vertical sectional view of a grinding apparatus constructed in accordance with a preferred embodiment of the present invention and adapted to carry out the present novel method of grinding,

Fig. 2 is a cross-sectional view of a blocking body constructed in accordance with the present invention and showing wedge blanks mounted on the blocking face thereof in position for grinding,

Fig. 3 is a plan view of the blocking body shown in Fig. 2 and looking at a blocking face of said body, and

Fig. 4 is a vertical sectional view of a second embodiment of the present invention.

Like reference characters refer to corresponding parts throughout the drawings.

Inasmuch as the manufacture of optical wedges requires precision in the wedge surfaces and accuracy in wedge angles which are most rigid, the present invention will be described in connection with the manufacture of such wedges. However, it is pointed out that this method and apparatus is just as applicable to the manufacture of wedges for any purpose, or from any material, i. e., metal wedges, etc., as will be appreciated by one skilled in the art after reading the present disclosure. For this reason, therefore, I have no intention of limiting the present invention to the manufacture of optical wedges, although their manufacture is specifically referred to by way of disclosing the present invention.

Generally speaking, the present method ••

grinding wedges includes first the step of rendering one face of a blank of work plano. This plano surface constitutes one of the final faces of the wedge, and the other face of the blank is ground plano at an angle thereto to give a wedge having the desired wedge angle. According to the present invention, this first finished plano face of the blank is used to mount the blank relative to a grinding plane so that said plano face is at an angle to the grinding plane equal to that desired in the wedge. This is accomplished according to the present invention by mounting the plano face of the blank in contact with a spherical concave blocking surface at a given distance from a radial line to the surface. This blocking surface is then mounted so that the radial line to the surface used as a reference point is perpendicular to the grinding plane, and the exposed face of the blank is ground until a desired area thereof is plano. As a result, the angle between the two plano faces is the wedge angle desired. By altering the distance from the reference radial line of the concave blocking surface at which the blank is located on said surface, the wedge angle generated can be varied. By virtue of this blocking method, relatively large adjustments of the blank on the blocking surface result in small differences in angle, and this fact makes it relatively easy to obtain accurate wedge angles. Furthermore, when a plano surface is blocked in engagement with a spherical concave surface, only the edge or corner of the plano surface contacts the blocking surface, depending upon the shape of the plano surface, with the result that the useful portion of the plano surface is not damaged in any way.

To make optical wedges according to the present invention, glass blanks of sufficient size and thickness to make the desired wedge are obtained first. These glass blanks may be circular disks, as shown at B in the drawings, or they may be of any desired shape, depending upon what is called for by the production specifications. One face of the glass blank is then ground and polished accurately plano in any well-known manner, and the finishing of this face should be precise because it constitutes one of the final faces of the wedge and controls the wedge angle to be generated.

Referring now to Figs. 2 and 3, after one face of a plano blank is finished plano, the blank B is mounted on the spherical concave blocking surface 10 of a blocking body 11 with the plano face thereof in engagement with the blocking face. It is a well-known geometric law that if a sphere is cut by a plane the section generated will be a circle. Accordingly, if the glass blanks are circular, then when they are placed with their plano surface in contact with the concave blocking face, they will have a line contact throughout their circumference with the blocking surface. On the other hand, if the blanks are rectangular, as is sometimes the case, the plano face of such a blank would contact the blocking face at its four corners. Regardless of the shape of the blank, the important facts are, that the blank is stably supported on the concave blocking face with its plano surface in a definite plane, and the useful portion of the plano surface, being out of contact with the blocking surface, is not subjected to scratching or other damage, which might preclude its being finally finished before blocking for the generation of the second wedge surface.

Any suitable means may be used for mounting the blank on the blocking face. By way of example, I have found that the use of pitch, a thermo-plastic or thermo-setting material is particu-

larly suitable for this purpose. In this connection, I have found that the finished plano surface can be covered with the pitch so that the pitch will fill in the recess between the blocking face and the plano surface of the blank; or after a blank is properly seated on the blocking face, then the same may be surrounded by a bead of pitch, as indicated at 13 in the drawings, which bead will serve to hold the blank firmly in place on the blocking face during the grinding operation.

As indicated in Fig. 2, the blank or blanks are adapted to be located on the blocking face at given distances from a given radial line, indicated at R, to the blocking face. The invention does not depend upon any specific radial line to the blocking face being used as a reference point in this connection, because it is the location of the blocking body relative to the grinding plane so that the radial line chosen as a reference is perpendicular to the grinding plane that is the controlling factor. However, to facilitate the use of this blocking method with standard grinding apparatus, as will be appreciated from the following description, the radial line to the blocking face which bisects an arc constituting an element of the effective portion of the spherical concave face is chosen as the reference line for locating the blank, or blanks, on the blocking face. As shown in Fig. 2, this radial line R intersects the concave blocking face of the point P, which is the deepest point of the curve, and which, in the present instance, where the edge of the concave face is a circle, constitutes the center of the concave face. It will also be noticed that the radial line R is perpendicular to the grinding plane indicated at G, and is also perpendicular to the bottom 12 of the blocking body, which in the preferred embodiment is accurately plano and is adapted to be mounted in a plane parallel to the grinding plane.

As shown in Fig. 1, the wedge blanks, blocked in the manner set forth, are adapted to be ground on a standard grinding apparatus which may comprise a flat grinding tool 15 which is movable in its own plane to define the grinding plane G. While the tool may be moved in its own plane in any one of a number of ways, I have shown it mounted so as to be capable only of a rotative movement, a shaft 16 connected thereto being rotated by a pulley and belt arrangement indicated at 17. As is well known, the tool is capable of movement to and from the work to permit a grinding pressure to be applied to the work, and to permit the blocked work to be removed from, and placed, beneath the tool. To this end, the shaft 16 may be slidably mounted in bearings, not shown, and the pulley may be connected to the shaft by a spline or key 18. Weights W, slidably mounted on the upper end of the shaft 16 and supported by a shoulder W' thereon, apply the grinding pressure to the work. Means, not shown, may be provided for normally raising the grinding tool from the table 14 while the work is being placed thereon or removed therefrom.

The blocking body 11 is mounted relative to the grinding plane G so that the radial line R is perpendicular to the grinding plane. To do this, the table 14 of the grinding machine is mounted so that its top, which is accurately plano, is parallel to the grinding plane, and the plano bottom 12 of the blocking body 11 is mounted in surface contact therewith. The blocking body 11 may be attached to the top of the table in any suitable manner, and while I have shown the same held onto the table by a plurality of bolts 19 extending through bores in the table and threaded into

the blocking body, it will be understood that the table might be made so as to constitute a magnetic chuck so that the blocking body would be held thereon by magnetic force. I have shown the table 14 rotated by means of a belt and pulley arrangement 20, but it is pointed out that the table could be held stationary if desired.

Looking now at Figs. 2 and 3, it will be readily understood by those skilled in the art, that the wedge angle generated by grinding the exposed face of the blank blocked on the blocking body will increase and decrease as the distance at which the blanks are mounted radially from the radial line R increases and decreases, respectively. The further the block is mounted from the radial, or reference, line R the greater will be the wedge angle generated. The distance referred to above is from the radial line R to the middle of the bottom or plano face of the blank. Accordingly, the wedge angle to be generated is controlled by the position of the blank on the concave blocking face with reference to the radial line R, and a desired angle can be obtained by carefully locating the blank on the blocking face with respect to this reference point. Therefore, a single blocking surface of this nature will serve as a blocking means for the generation of a number of different wedge angles, and is, therefore, a definite improvement over prior art procedures and apparatus where a separate blocking tool is required for the generation of each wedge angle regardless of how small their differences might be. Furthermore, if the curvature of the blocking face is not too steep, a relatively large adjustment of the blanks radially of the line R, or the center of the face, will give only very small changes in wedge angle, whereby it is very easy to make critical adjustments in angle in order to obtain a definite small wedge angle.

With the present invention it is possible to simultaneously grind a plurality of wedges having the same or different wedge angle. To do this, and obtain equal wedge angles, it is merely necessary to mount the center of each blank B on the blocking face at the same distance from the radial line R, or the center of the face in the present instance. If a plurality of equal wedges are to be made in which the tolerance of the wedge angle is very close, the prime problem confronting the operator is to be able to locate the blanks on the blocking face at exactly the same distance from a specific reference point, namely, the radial line R to the spherical face. To expedite this step, the spherical concave blocking face may be encircled by a flat rim 25 which may be formed by grinding off the corners of the concave face by a flat grinding tool moving in the grinding plane G. This is the same as cutting the spherical concave face by a plane parallel to the grinding plane and perpendicular to the radial line R of the concave face, so that the intersection between the plane rim 25 and concave face forms a sharp edge 26 which is circular with the radial line R as a center. Therefore, the edge 26 is used as a reference line, and if the wedge blanks B are of uniform shape and size, as are the disk-shaped blanks B shown in the drawings, then if the blanks are mounted on the blocking face with their edge contacting the reference edge 26, then each blank will be located at exactly the same distance from the radial line R, and each wedge when ground will have the same wedge angle.

This rim 25 on the blocking body has another useful function. It serves as a reference plane for measuring the thickness "T" of the edge of

the wedge, see Fig. 2, by means of a depth micrometer, or other suitable method. Specifications for wedges, in addition to specifying a given wedge angle, very often specify the thickness of one edge, or portion of the edge, for purposes of mounting the wedge in an optical system. Therefore, the blanks in the present instance will be ground down until the thickness "T" is a desired value, and this dimension can be readily checked by depth miking from the ground surface of the wedge to the rim 25. If it is not desired to make all of the wedges at the same angle, or if it is desired to generate wedge angles which would require the blanks being located closer to the center of the blocking face than the edge 26 specifies, this reference edge can be used as an accurate reference point from which to measure in order to accurately locate the blanks on the blocking face for the generation of desired angles.

Another means for accurately locating a number of blanks at the specified distances from the radial line on the blocking face is shown in Fig. 4. As shown, a spacing member 30, in the form of a disk, or other shape, may be attached, in any suitable manner, to the blocking face 10' with its center, or other reference point thereon, in alignment with the radial line R' to the spherical concave blocking face. Then, if certain, or all, points on the edge of said spacing member are at a given distance from the reference point thereof, when the wedge blanks are brought into abutment with the locating points on the edge of said spacing member they will be accurately spaced relative to the radial line R' of the blocking face for the generation of given wedge angle. If a plurality of wedges of equal angle are to be made, the spacing member may be a circular disk of a diameter corresponding to the wedge angle desired. If wedges having different angles are to be made, the spacing member may be of any suitable irregular configuration, such as a spiral, a star, etc., so that different portions on its edge will be at different known distances from the reference point thereof, and will, accordingly, serve to locate blanks at different distances from the radial line R' in accordance with the different wedge angles desired. The spacing member 30, in addition to serving to locate the blanks on the blocking face at given distances from the radial line R', also serves to counteract any radial pressure, due to the grinding action, which would tend to move the blanks radially inwardly of the blocking face.

In lieu of the blocking body being rigidly mounted in the grinding machine with respect to the grinding plane, it may be mounted as shown in the embodiment disclosed in Fig. 4. In this instance, the blocking body 11' may be exactly the same as the blocking body above described in every respect except the manner of mounting it with respect to the grinding plane. The blocking body 11' is adapted to be mounted relative to the grinding plane G by a universal joint, such as a conventional ball-and-socket arrangement 31. It makes no difference whether the blocking body 11' is supported above or below the grinding plane, or whether the grinding pressure is applied downwardly through the blocking body, or downwardly through the grinding tool. The important factor is that the control point of pressure is applied to the blocking body at the universal joint, and if the socket in the blocking body is in alignment with the radial line R', which is used as a reference point in locating the blanks B' on the blocking surface, then the

blocking body will automatically orient itself so that the grinding plane G is perpendicular to the radial line R' regardless of whether or not the axis of the spindle of the ball-and-socket joint is perpendicular to the grinding plane. In order for this embodiment to function properly, it is necessary that each of a plurality of blanks mounted on the blocking face be substantially the same thickness at the start of the grinding operation. Otherwise, the difference in thickness of the blanks will affect the orientation of the blocking body relative to the grinding plane, and prevent the radial line R' from assuming a position perpendicular to the grinding plane. In addition, it is necessary, to the successful operation of this embodiment of the invention, that the work be more or less symmetrically spaced on the blocking face with respect to the universal joint, or pressure control point, thereof so that the body will not be out of balance and which condition, if too extreme, would affect the proper orientation of the blocking body due to the inherent characteristics of the universal joint. In this arrangement, the wedge angle produced depends not only upon the curvature of the blocking body, the distance of the center of the blanks from the center of the blocking face, but also upon the uniformity of the thickness of the blanks.

It will be appreciated by those skilled in the art that the proper functioning of the present invention is dependent upon the plano face of the blanks B being accurately located with their edges in contact with the blocking face. If one locating portion of the edge of the blank is held out of contact with the blocking face by a piece of dirt, no matter how minute, the desired wedge angle for that particular location of the blocking face will be thrown off. For this reason, it is essential that the blocking face and the plano surface of the blanks be carefully cleaned prior to blocking the work. In order to be sure that the blanks are in proper contact with the blocking face before starting the grinding operation, the use of interference patterns can be resorted to. If the blocking body is made of glass, as it might very well be, and a monochromatic light is directed through the block, and one of the blanks mounted thereon, then there will be an interference pattern of alternate light and dark rings visible due to the difference in the thickness of the air space between the plano face of the blank and the blocking face. When the blank is in contact with the blocking face, the entire circular edge, in the case of a circular blank, a dark fringe will appear, and if this fringe is completely circular, and the remaining fingers are symmetrical thereto, this will indicate that the blank is properly seated on the blocking face. If the blocking body is not glass, but is some other material, such as iron, the same principle could be used; but instead of directing the monochromatic light through the blocking body and blank, a reflection principle would have to be used. In this case, the blocking face could be polished to constitute a specular surface. Then monochromatic light could be directed through the blank normal to its face, and this light upon being reflected from the circular blocking face back through the blank would give the characteristic interference pattern as before. So that light could be directed normally to the face of the blank, and the interference pattern produced could also be observed normally to the face of

the blank, a semitransparent mirror system, such as a Gauss eye-piece, could be used.

While for the purposes of disclosure, I have particularly referred to the manufacture of wedges which are circular in shape, it will be appreciated that wedges of any shape may be ground by the present invention. For instance, if rectangular wedges are desired, and the angle is desired the long way of the wedge, a rectangular blank would be used and would be mounted with its long dimension lying along a radius of the blocking face emanating from the intersection of the radial reference line R with the face in the center, or from the point P in Figs. 2 and 3. In this case, the plano face of the blank would engage the blocking face at the four corners, rather than over the entire perimeter as is true in the case of circular blanks. It will undoubtedly be obvious that the ground face of the blanks could be polished while on the blocking body by merely replacing the grinding tool with the polishing tool. The fact that this method and apparatus is capable of extremely accurate work is attested by the fact that given wedge angles have been obtained with this set-up within tolerances of $\pm$ five seconds of arc, and the finished surface is generally perfect enough so as to require no further hand correction.

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

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

1. The method of grinding a wedge from a blank of work and comprising the steps of rendering one face of the blank plano, mounting the blank on a spherical concave surface with its plano face engaging said concave surface and with the center of the blank located to one side of the bisector of an arc constituting an element of said concave surface, the engagement between the concave surface and said plano face being a line contact in the case of a circular blank and a plural point contact with non-circular blanks and grinding the exposed surface of the blank until a desired area of it is plano and lies in a plane perpendicular to said bisector.

2. A method according to claim 1, and including the step of adjusting the blank radially of said bisector until the desired wedge angle is obtained, movement of the blank outwardly and inwardly radially of the concave surface being conducive to larger and smaller wedge angles, respectively.

3. The method of simultaneously grinding a plurality of wedges having the same wedge angle, and comprising the steps of rendering one face of each of a plurality of similar blanks plano, then mounting the blanks on a spherical concave surface at equal distances radially from the bisector of an arc constituting an element of said concave surface and with the plano surface in engagement with said concave surface, the engagement between the concave surface and said plano face being a line contact in the case of a circular blank and a plural point contact with non-circular blanks and simultaneously grinding the exposed surface of all of the blanks until a desired area of each lies in a plane perpendicular to said bisector.

4. The method of simultaneously grinding a plurality of wedges each having a different wedge angle, and comprising the steps of rendering one face of each of a plurality of similar blanks plano, then mounting the blanks on a spherical concave surface at different distances from a radial line to said concave surface with said plano surfaces in engagement with said concave surface, the engagement between the concave surface and said plano face being a line contact in the case of a circular blank and a plural point contact with non-circular blanks and simultaneously grinding the exposed surface of all of the blanks until a desired area of each lies in a plane perpendicular to said radial line.

5. The method of simultaneously grinding a plurality of wedges having the same desired angle, and comprising the steps of making a plurality of blanks substantially plano parallel and substantially of equal thickness, then mounting the blanks on a spherical concave supporting surface, having a single, universally movable, pressure control point, at equal distances radially from said control point with one of the plano surfaces of each thereof in engagement with said concave supporting surface, the engagement between the concave surface and said plano face being a line contact in the case of a circular blank and a plural point contact with non-circular blanks and simultaneously grinding the exposed surface of each of said blanks with a flat tool moving in its own plane.

6. A method according to claim 5, and including the step of adjusting the blanks radially of the control point of said concave surface, until the desired angle is obtained in the wedges, movement of the blanks outwardly and inwardly radially of the surface resulting in larger and smaller wedge angles, respectively.

7. Apparatus for grinding optical wedges from work blanks having a plano face comprising in combination a grinding tool, means for moving said tool to define a grinding plane, a blocking body in opposed relation to said grinding tool and including a spherical concave blocking face, means for mounting said blocking body whereby a radial line to said concave surface remains perpendicular to said grinding plane, and means for mounting a blank of work on said blocking face to one side of said radial line and with its plano face adjacent the blocking face and engaging the same in a line contact at the peripheral edge of the blank when the same is circular and engaging the same at a plurality of points when the blank is non-circular, whereby the plano face of the blank is located at an angle to the grinding plane.

8. An apparatus for simultaneously grinding a plurality of wedges of the same angle from work blanks having a plano face comprising in combination a grinding tool, means for moving said tool to define a grinding plane, a blocking body in opposed relation to said grinding tool and including a spherical concave blocking face, means for mounting said blocking body, whereby a radial line to said concave surface remains perpendicular to said grinding plane, and means for mounting a blank of work on said blocking face to one side of said radial line and with its plano face adjacent the blocking face and engaging the same in a line contact at the peripheral edge of the blank when the same is circular and engaging the same at a plurality of points when the blank is non-circular, whereby the plano face of the blank is located at an angle to the grinding plane.

9. An apparatus for simultaneously grinding a

plurality of wedges of the same angle from work blanks having a plano surface and comprising in combination a flat grinding tool, means for moving said tool in its own plane to define a grinding plane, a blocking body in opposed relation to said grinding tool, and including a spherical concave blocking face, means for supporting said blocking body whereby a radial line to said concave blocking face is perpendicular to the grinding plane when the parts are in operative relation, and means for mounting a plurality of the blanks of work on said blocking face at equal distances from said radial line and with their plano faces adjacent the blocking face, and engaging the same in a line contact at the peripheral edge of the blanks when the same are circular and engaging the face at a plurality of points when the blanks are non-circular.

10. An apparatus for simultaneously grinding a plurality of wedges of the same angle from work blanks having a plano surface and comprising in combination a flat grinding tool, means for moving said tool in its own plane to define a grinding plane, a blocking body having a spherical concave blocking face, means for supporting said blocking body in opposed relation to said grinding tool, whereby the same is free to assume a position in which the bisector of an arc constituting an element of said spherical surface is perpendicular to the grinding plane, and means for mounting a plurality of the blanks of work on said blocking face with the plano face thereof adjacent the blocking face and engaging the same in a line contact at the peripheral edge of the blanks when the same are circular and engaging the face at a plurality of points when the blanks are non-circular and at equal distances radially of said bisector of the blocking face.

11. An apparatus according to claim 10, and in which the supporting means for the blocking body constitutes a universal joint disposed in alignment with said bisector of the concave surface.

12. An apparatus for simultaneously grinding a plurality of wedges from work blanks having a plano surface and comprising in combination a flat grinding tool, means for moving said tool in its own plane to define a grinding plane, a blocking body mounted in opposed relationship to said grinding tool, and including a spherical concave blocking face on which the blanks of work are adapted to be mounted with their plano surface adjacent and engaging the blocking face in a line contact at the peripheral edge of the blanks when the same are circular and engaging the blocking face at a plurality of points when the blanks are non-circular, and spaced on said blocking face at given distances from a radial line to said face, said blocking face disposed so that said radial line is perpendicular to the grinding plane.

13. An apparatus according to claim 12, and in which the concave blocking face is encircled by a plane rim formed by cutting the concave surface by a plane perpendicular to said radial line, the intersection of said rim and concave blocking face forming a reference edge which is circular in shape with said radial line as a center, whereby said reference edge facilitates the location of the blanks on said concave blocking face with reference to said radial line to obtain the wedge angles desired.

14. An apparatus according to claim 12, and including a spacing member of given dimension radially from a reference point thereon, said

spacing member mounted on said concave blocking face with said reference point in alignment with said radial line, whereby the outer edge of said spacing member constitutes a locating surface against which the blanks of work may be abutted to locate said blanks relative to said radial line to give the wedge angle desired.

15. A blocking body for use in the grinding of wedges from blanks of work having one plano face and comprising a body adapted to be mounted in opposed relation to a grinding plane, said body including a spherical concave blocking face on which the blanks of work are adapted to be mounted at given distances radially of a point on the face formed by the intersection thereof with a given radial line of the face and with their plano face in engagement with the blocking face, said blocking body being adapted to be disposed relative to the grinding plane with said radial line perpendicular to said plane, the engagement between the blanks and said blocking face being a line contact at the peripheral edge of the blanks when the latter are circular and being a plural point contact when the blanks are non-circular.

16. A blocking body for use in the grinding of wedges from blanks of work having one plano face, and comprising a body adapted to be mounted in opposition to a grinding plane, said body including a spherical concave blocking face on which the blanks are adapted to be mounted with their plano surface in engagement with the blocking face, a plane rim encircling said concave blocking face, the intersection of said rim

and blocking face forming a circular reference edge to facilitate the mounting of the blanks on the blocking face at known distances from the center of said blocking face to obtain given wedge angles, and said rim providing a reference surface for measuring the thickness of one edge of the wedge during the grinding operation, the engagement between the blanks and said blocking face being a line contact at the peripheral edge of the blanks when the latter are circular and being a plural point contact when the blanks are non-circular.

17. A blocking body for use in the grinding of wedges from blanks of work having one plano face, and comprising a body adapted to be mounted in opposition to a grinding plane, said body including a spherical concave blocking face on which the blanks are adapted to be mounted with their plano surface in engagement with the blocking face, a spacing member of given dimension radially from a reference point thereon mounted on said concave blocking face with its reference point in alignment with a given point on said face, whereby the outer edge of said spacing member constitutes a locating surface against which the blanks of work may be abutted to locate said blanks relative to said given point on said face to give the wedge angle desired, the engagement between the blanks and said blocking face being a line contact at the peripheral edge of the blanks when the latter are circular and being a plural point contact when the blanks are non-circular.

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