L. G. SIMPSON.

ASTIGMATIC LENS GRINDING MECHANISM.

APPLICATION FILED AUG. 7, 1916.

1,287,479. Patented Dec. 10, 1918.

Fig-1-

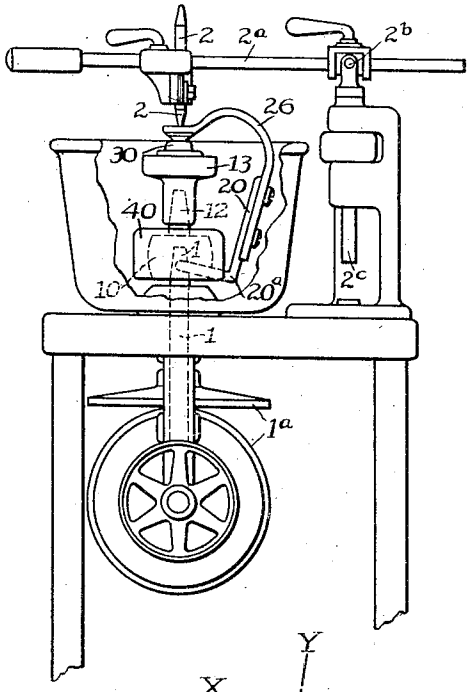


Fig-5-

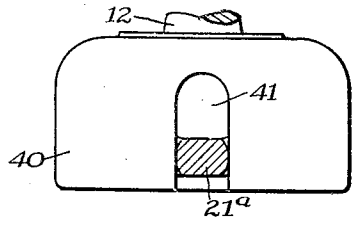


Fig-4-

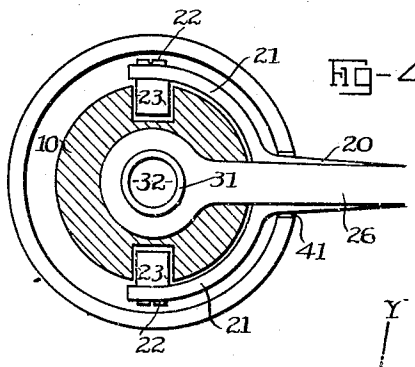


Fig-2-

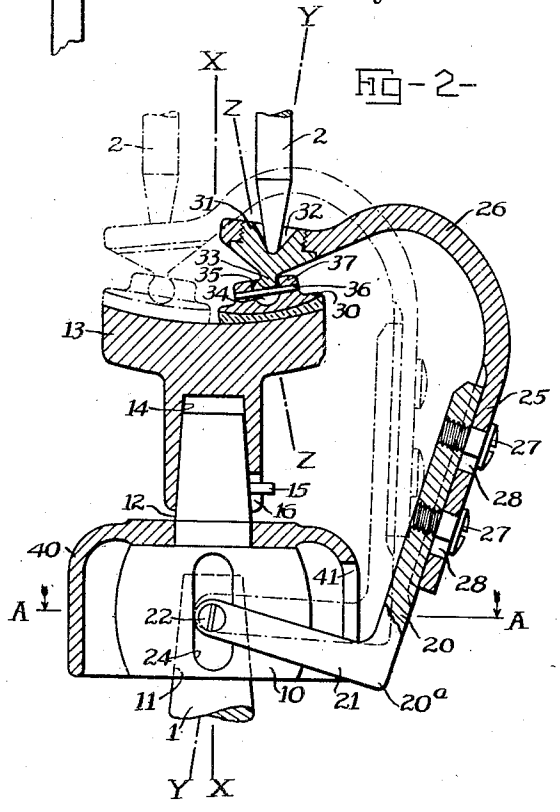
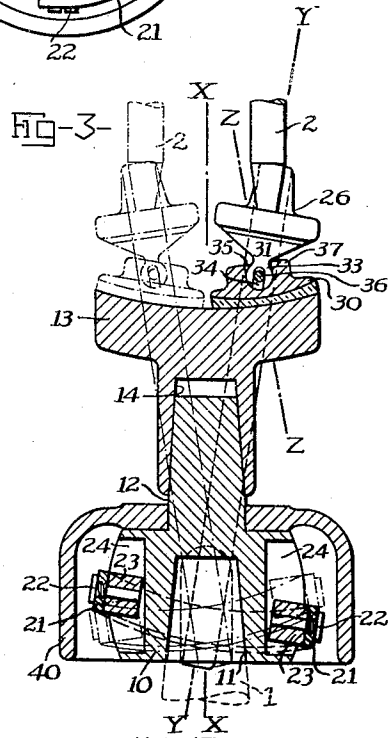


Fig-3-



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UNITED STATES PATENT OFFICE.

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ASTIGMATIC-LENS-GRINDING MECHANISM.

1,287,479. Specification of Letters Patent. Patented Dec. 10, 1918.

Application filed August 7, 1916. Serial No. 113,497.

To all whom it may concern:

Be it known that I, LEON G. SIMPSON, a citizen of the United States, residing at Rochester, in the county of Monroe, State of New York, have invented certain new and useful Improvements in Astigmatic-Lens-Grinding Mechanism; and I do declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the characters of reference marked thereon.

My invention relates to grinding machines and more particularly relates to a grinding mechanism especially adapted for grinding astigmatic lenses, that is, lenses having their two meridians of different curvature, such as, cylinder lenses, toric lenses and prisms.

Salient objects of this invention are: To provide an improved lens grinding mechanism of the type that embodies means for connecting a grinding shell and lens mounted on a lens body together in order to preserve the relative angular relation of the abrading and abraded surfaces and thus maintain their meridianal alinement, wherein those parts which may obstruct the surfaces under abrasion, and ordinarily are in the way of the operator when he endeavors to apply abrasive material thereto, have been reduced to a minimum;

To provide a lens grinding mechanism of this character, that is so organized that it may be readily attached to and detached from ordinary forms of lens grinding machines in use today;

To provide an improved connection between the supporting and driving mechanism and the grinding implement;

To provide a lens grinding mechanism wherein all moving parts are protected from the abrasive used in grinding and polishing.

In the drawings:

Figure 1 is a right end elevation of a lens grinding machine to which a lens grinding mechanism constituting an embodiment of my invention has been applied, the splash bowl of the machine having been broken away to more fully disclose the application of my invention.

Fig. 2 is a view in the same elevation but on a larger scale, of the lens grinding mechanism illustrated in Fig. 1, shown associated with the grinding spindle and the lens body spindle of the grinding machine, certain parts of the mechanism being shown in vertical section, and certain of the relatively movable parts being shown in alternative positions.

Fig. 3 is a vertical section taken on the line X—X of Fig. 2 looking from left to right, showing the lens grinding mechanism with certain of its relatively movable parts in alternative positions.

Fig. 4 is a sectional plan view taken on the line A—A of Fig. 2, the lens driving link being shown in full plan view.

Fig. 5 is a fragmentary elevation looking from the right of Fig. 2, the grinding shell support being broken away at the point where it emerges from the abrasive guard.

Like characters of reference throughout the drawings indicate the same parts.

The illustrated embodiment of my invention has been especially designed as an attachment that may be readily applied to or removed from any of the usual forms of prescription grinding machines commonly in use today, such for example as that illustrated in Fig. 1. These machines as a class usually embody a rotatable grinding shell spindle such as 1 which in the present instance is journaled in the machine frame and driven by a variable speed friction driving mechanism 1^a, and a shiftable lens body spindle such as 2 which is carried by an overhanging arm 2^a, movable about the axis of the trunnions 2^b and also about the axis of the trunnion spindle 2^c.

The grinding mechanism about to be described comprehends a support upon which the grinding shell is mounted, and a link connecting the lens body upon which the lens to be ground is blocked to the grinding shell support in such a manner that relative rotative movement of the grinding shell and lens is prevented while relative lateral movement is permitted. The grinding shell support is adapted to be mounted on a rotatable grinding spindle and the lens body or lens body end of the link is adapted to be en-

gaged by a lens body spindle, and thus when the support is rotated and the lens body, which being carried by the grinding shell and driven by the link in the same general direction as the shell, is held with its axis of rotation eccentric to the axis of rotation of the shell or, what is preferable, when the lens body is moved back and forth across the grinding shell, which may be done by swinging the lens body spindle laterally: a differential movement of the grinding shell and the lens body is produced which sets up a grinding action between the grinding shell and the lens without disturbing the meridianal alinement of the two.

To this end I provide a grinding head 10 which is provided in its under side with a concentric taper socket 11, adapted to fit on the tapered upper end of the grinding spindle 1. On the upper end of the head 10, I provide a tapered shank 12 which is designed to receive a grinding shell 13, which we will presume is a toric grinding shell having a 6.00 diopter curve in one meridian and a 6.75 curve in the other meridian. The shank 12 on the grinding head and the socket 14 of the grinding shell 13 are preferably made the same in size and taper as the grinding spindle 1 and the socket 11. As an additional precaution against the possibility of relative angular movement between the grinding shell 13 and the shank 12, a projecting pin 15 is provided in the shank 12 in position to engage with the slot 16 which slot is formed as shown, in the hub of each of the grinding shells that are to be used on the shank 12. By using a single pin 15 and slot 16 each grinding shell will always set upon the spindle 1 in the same position.

For linking the lens body 20 to the head 10 in such a manner that when a lens is blocked thereon and the lens body is arranged in coöperative relation with a grinding shell mounted on the grinding head, the two grinding implements, namely the grinding shell and the lens body with its lens, may be maintained in meridianal alinement whether they are actuated or not, that is to say for example, that when the grinding shell rotates for a given angular distance about its axis, the lens body must rotate for exactly the same angular distance in the same general direction about its axis; and yet to allow universal tilting movement of the lens body or carrier about its connection to the grinding head: I provide a rigid link connected at one end through a universal connection to the head 10 and at the other end through a universal coupling to the lens body.

The universal connection at the lower end comprises a bifurcated yoke member consisting of a shank 20 provided with a pair of yoke arms 21, and in the extremity of each of these arms, is threaded one of a pair of studs 22, each having an inwardly extending portion upon which is mounted a roller 23. The rollers 23 coöperate with a pair of diametrically opposite elongated slots or recesses 24 cut into the sides of the ball shaped body of the head 10, and extending in the direction of its axis of rotation. This connection permits the shank 20 to be raised or lowered, swung about the axis of the rollers 23, toward and away from the vertical axis of the head 10 and to be swung laterally about an axis intermediate and at right angles to the axis of the rollers; but it will not permit of any rotative movement of the shank 20 about the vertical axis of the head 10. The shank 25 of the arm 26, which forms the upper portion of the link connecting the head 10 with the lens body 30, is adjustably secured to the shank 20 of the yoke portion of the link by means of a pair of screws 27 passing through slots 28 in the shank 25 and threaded into the shank 20 of the yoke member. To further insure the rigidity of the link and to hold the parts in alinement the shank 25 and the shank 20 are joined together by a tongue and groove connection as best shown in Fig. 2. The screws 27 serve to hold the two parts of the link rigidly together after the desired adjustment for length has been made.

The free end of the arm 20 forming the upper portion of the link is enlarged to accommodate the removable hardened steel coupling member 31 which is preferably threaded therein and is adapted to coöperate simultaneously with the lower end of the lens body spindle 2 and with the lens body 30, forming a universal coupling for guiding and operating the lens body and at the same time constraining the motion of the link.

In the upper portion of the coupling member is formed a center 32 in the form of a spherical or conical recess in which the end of the spindle sets and the lower portion of the coupling member is formed into a ball end 33 having a transverse slot cut therethrough as best shown in Figs. 1 and 2. A socket, preferably a spherical bottomed socket 35, having a removable pin 36 extending diametrically across its center of curvature, is provided in the lens body 30, and engages with the split ball 33 in the manner of a clutch or coupling, the end of the ball seating in the bottom of the socket and the pin passing through the slot in the ball. The wall 37 surrounds the socket 35 and extends upwardly for a sufficient height to prevent abrasive material from accidentally getting into the bearing, and oil from being thrown out of, the socket. This forms a universal coupling for detachably connecting the driving link with the lens body.

Salient features peculiar to the construction of the universal coupling and the adja-

cent end of the link are that the ball and socket bearing of the coupling provides an ample bearing surface for transmitting the pressure necessary for grinding and at the same time accurately centers and constrains the lens body without being seriously affected by wear. Also the parts that are subjected to the greatest wear, namely, the coupling member 31 and the pin 38 are made so that they may be readily replaced.

A guard or skirt 40 carried by the head 10 covers the mechanism of the universal connection at the lower end of the link. This guard is provided with an elongated vertical opening 41 through which the rounded portion 21^a of the link passes as shown in Figs. 3 and 4. In order that all of the abrasive material shall be kept outside of the guard 41, I prefer to make the angle between the arms 21 and the shank 20 as viewed in Fig. 1 sufficiently acute to insure the arms 21 always inclining downward toward the lower edge 20^a of the link member. Thus even when the link is moved across to the remote side of the grinding shell as shown in dot and dash lines in Fig. 3, it will be observed that the arms 21 still incline downward toward the edge 20^a and therefore, fluid abrasive material that may be gathered by the exposed parts of the link member and any oil or similar material on the arm 21, when in sufficient quantity, will trickle down toward the edge 20^a from which edge the fluid material can drip clear of the mechanism.

While the relatively movable parts of the present embodiment of my invention may be operated in various ways whereby to produce the grinding action between the lens blank and the grinding shell, I prefer, because of the facility with which the grinding may be done in this manner, to rotate the grinding spindle 1 and either to hold the axis of the lens body eccentric to the axis of rotation of the grinding shell or what is preferable, to move the axis of the lens body from side to side across the surface of the grinding shell by means of the lens body spindle 2. The relative positions assumed by the parts of the grinding mechanism with relation to the rigid parts of the grinding head when the mechanism is actuated in this manner are clearly shown in Figs. 1 and 2 of the drawings, wherein four critical positions of the mechanism, taken two in each of a pair of perpendicular planes, are shown.

When the lens body spindle while in engagement with the grinding mechanism as shown in Figs. 1 and 2, is moved directly over the axis of rotation Z—Z of the grinding spindle 1 and the lens spindle is rotated, all of the parts of the mechanism rotate about this axis. In this position there is no relative movement or grinding action between the lens blank and the grinding shell. However, when the mechanism is shifted by means of the spindle 2, out of the axis Z—Z as shown in full lines in Figs. 2 and 3 and the mechanism is rotated by the grinding spindle, the rigid parts of the grinding head continue their rotation about the axis X—X but the link and its parts are rotated about the axis Y—Y and the lens body is rotated about the axis Z—Z. As soon as the link and the lens body begin to rotate about axes independent of the axis of rotation of the grinding spindle, the grinding action is set up between the lens blank and the grinding shell.

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

1. In a grinding machine, the combination with a support having a grinding implement rigidly mounted thereon and a second grinding implement adapted to cooperate with the first named implement, of a link extending around one side of the grinding implements while leaving the other sides unobstructed, one end of said link being attached to the support by a universal connection and the other end being adapted to be connected to the second grinding implement by a universal coupling.

2. In a grinding machine, the combination with a grinding head provided with a body portion of arcuate contour having two pairs of bearing surfaces formed one pair on each of two sides thereof and extending in a direction substantially parallel to the longitudinal axis of the head, of a yoke embracing the body portion and provided with a pair of alined studs each projecting into engaging relation with one of the pairs of bearing surfaces, a link attached to the yoke and a pair of cooperating grinding implements attached one to the grinding member and the other to the link.

3. In a grinding machine, the combination with a grinding head provided with a body portion of arcuate contour having two pairs of bearing surfaces formed one pair on each of two sides thereof and extending in a direction substantially parallel to the longitudinal axis of the head, of a yoke embracing the body portion and provided with a pair of alined studs each projecting into engaging relation with one of the pairs of bearing surfaces, a skirt extending outwardly and downwardly from the head and surrounding the yoke and body portion, a link attached to the yoke and extending through the depending portion of the skirt, and a pair of cooperating grinding implements attached one to the grinding member and the other to the link.

4. In a grinding machine, the combination with a pair of cooperating grinding implements and a support for one of the implements, of a link flexibly connected at one

point to the second grinding implement and attached at another point to the support through universal connecting means, the portions of the link extending away from the grinding implements and away from the connecting means each being directed downwardly toward a common drip point located below said implements and connecting means, whereby fluid material may collect at and drip off of, said drip point.

LEON G. SIMPSON.

Witnesses:
WILLIAM G. WOODWORTH,
GEORGE A. PAGE.