March 16, 1926. 1,577,137

A. E. MAYNARD

LENS GRINDING MACHINE

Filed August 22, 1921 2 Sheets-Sheet 1

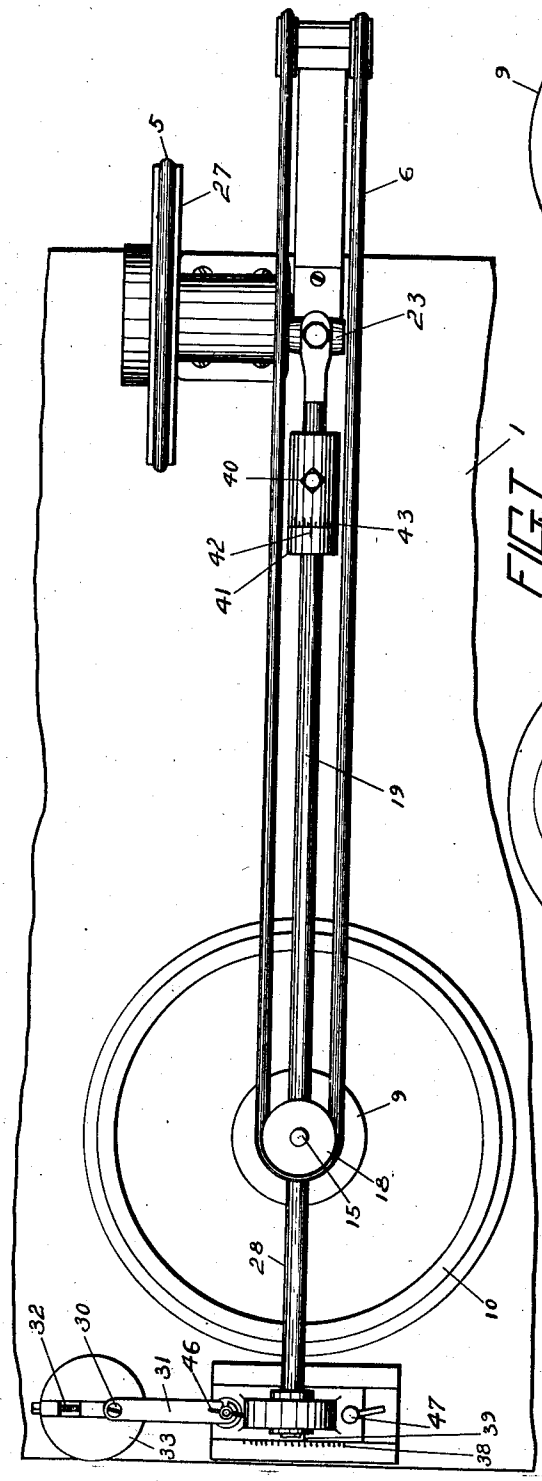


FIG. I

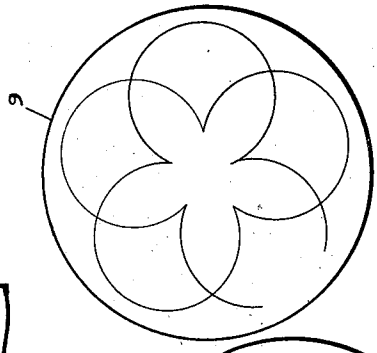


FIG. VI

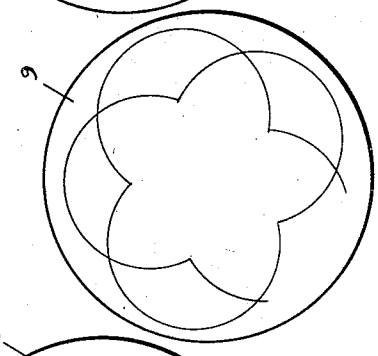


FIG. V

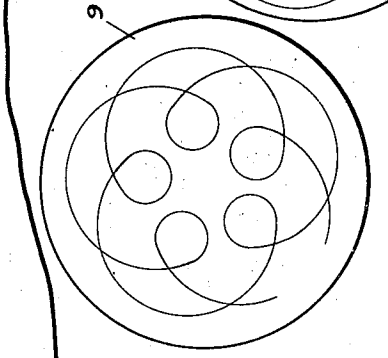


FIG. IV

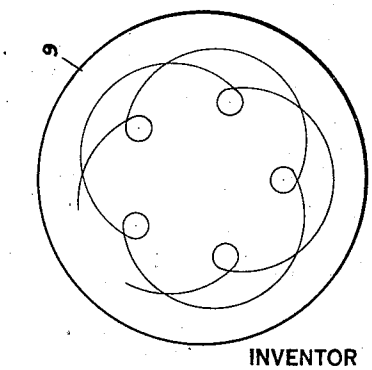


FIG. III

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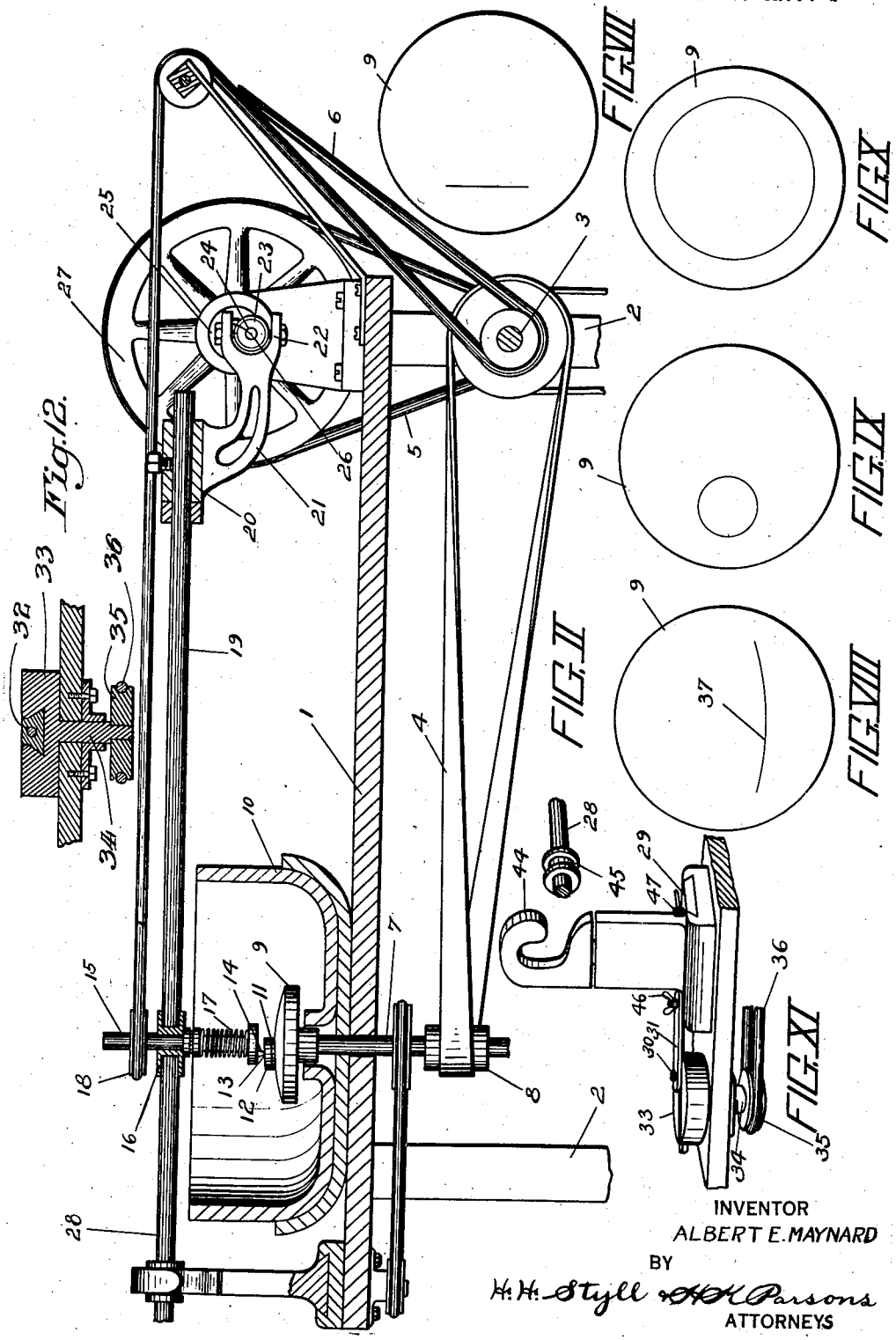


Fig. 12.

FIG. VIII

FIG. X

FIG. IX

FIG. II

FIG. VIII

FIG. XI

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UNITED STATES PATENT OFFICE.

ALBERT E. MAYNARD, OF SOUTHBRIDGE, MASSACHUSETTS, ASSIGNOR TO AMERICAN OPTICAL COMPANY, OF SOUTHBRIDGE, MASSACHUSETTS, A VOLUNTARY ASSOCIATION OF MASSACHUSETTS.

LENS-GRINDING MACHINE.

Application filed August 22, 1921. Serial No. 494,346.

To all whom it may concern:

Be it known that I, ALBERT E. MAYNARD, a citizen of the United States, residing at Southbridge, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Lens-Grinding Machines, of which the following is a specification.

This invention relates to improvements in lens-grinding machinery and has particular reference to a novel and improved form of mechanism especially adapted for use in the construction of ophthalmic lenses.

A further object of the invention is the provision of a machine for this purpose which shall be provided with a plurality of different elementary motions whose relationship may be varied to give combined relative movement of the tool and lens, of infinite variety, all of which shall have a satisfactory break-up relationship so as to avoid grooving or scratching of surfaces or production of wave effects on account of failure of the parts to secure a proper relative shifting or on account of undue frequency of transversal of one portion of the tool by the lens at the expense of a different portion of the tool.

A further object of the present invention is the provision of a machine of this character in which the several parts may be quickly and easily adjusted to vary the motions as desired and in which certain of the motions may be either manually or automatically attained as may be preferred.

Other objects and advantages of my improved construction should be readily apparent by reference to the following specification taken in connection with the accompanying drawings, and it will be understood that I may make any modifications in the specific details of the construction shown and described within the scope of the appended claims without departing from or exceeding the spirit of my invention.

Figure I is a plan view of one form of machine embodying my improvement.

Figure II is a longitudinal sectional view therethrough.

Figures III, IV, V and VI are plan views illustrating the paths described by the lens engaging point for different adjustments or relative speeds of the machine.

Figures VII, VIII, IX and X are detailed views of the various elemental movements going to make up the combination effect produced by my machine, and,

Figure XI is a fragmentary perspective view of a portion of the upper spindle controlling mechanism.

Figure XII is a detail sectional view on the line 12—12 of Figure I, showing the connection of the pulley 35 with the eccentric 33.

In the drawings, in which similar characters of reference are employed to denote corresponding parts throughout the several views, the numeral I designates the base of my improved machine having the ordinary supporting legs 2 of desired construction. Suitably journaled in one pair of the legs 2 is the main drive shaft 3 of my mechanism having extending forwardly therefrom the drive belt 4 and upwardly therefrom the pair of drive belts 5 and 6 respectively. It is of course to be understood in connection with the present machine that while I have illustrated it as equipped with belts for driving the several mechanisms hereinafter described, that any other customary form of gearing or drive connection may be substituted therefor and the parts themselves modified, so long as the effects produced are the same without in any wise varying from the main generic principles involved in my machine.

At the forward portion of the bed or table 1, I have shown journaled the spindle 7 having on its lower end the pulley 8 around which the drive belt 4 passes and having removably mounted on its upper end the lens-grinding lap or tool 9 contained within the bowl 10 which rests on the table and serves to prevent scattering of abrasives during the grinding operation.

To co-operate with the lens-grinding tool 9 the lens 11 is carried by the block 12 having a socket as at 13 to receive the crank or eccentric pin 14 carried at the lower end of the spindle 15. This spindle is slidably mounted in the head 16, being downwardly actuated as by the spring 17 surrounding this spindle but having its downward movement limited by the drive pulley 18 secured on the upper portion of the spindle and connected by the belt 6 with the main drive shaft 3. It is here that we secure two of

the elemental motions produced by the machine in that as the spindle 7 is rotated, the tool will be carried in a circular path beneath the point 13 holding the lens and lens block in place as is indicated by Figure X. On the other hand, the rotation of the spindle 15 will carry the pin 13 around in a small circle as is indicated in Figure IX of the drawings. These drawings may be considered as representing plan views of the lap 9 and as showing the path described by the point 13 for any individual relative shifting movement of the parts with all other movements eliminated.

It will, of course, be understood that it is necessary to in some way support the head 16. This in the present instance is shown as being carried by the rod or frame member 19 rotatably engaged in the sleeve portion 20 of the arm 21 which is pivoted as at 22 to the sleeve 23 of the adjustable eccentric pin 24 carried by the disc 25 on the shaft 26. This shaft 26 further bears the drive pulley 27 connected by the belt 5 with the drive shaft 3 for rotation of the shaft and thus movement of the eccentric pin. This movement, it will be seen, imparts a back and forth motion to the pin 13 as is indicated by the straight line in Figure VII. At the same time, however, the frame or arm member 19 may be swung about the pivot connection 22 in a substantially horizontal plane, or in other words, on an arc such as indicated in connection with Figure VII. This movement may be accomplished either manually by grasping of the handle 28 or through the use of automatic drive mechanism, such as is shown. This mechanism may include the slide 29 operated as by the eccentric 30 and link 31, the throw being varied through adjustment of the member 30 as by the screw 32. This member 30 is carried by the slotted disc 33 on the stud shaft or spindle 34 having the pulley 35 for the drive belt 36, which also passes around a pulley on the main spindle 7 so that the slide actuating member is directly driven therefrom. The slide, it will be understood, moves back and forth in a straight path and is provided with the swivelled hook-like head 44 to engage the spool 45 on the member 28, the spool being slidable on the member 28, which combined with the swivelling of the head 44, allows of free play of the parts as the member 15 moves in the arcuate path 37 indicated in connection with Figure VIII.

It will be understood that the position of this path may be varied by adjustment of the member 30. On the other hand, I find that it is sometimes desirable to dispense with this movement and to hold the member 15 against lateral movement. This can be accomplished by loosening the thumb nut 46 and disconnecting the link 31, in which case the slide may be locked in position as by the set screw 47. Suitable graduations 38 on the guide way are used for cooperating with a designation 39 on the slide to indicate the transverse adjustment at which the parts are secured.

A further point of importance in connection with a machine of this character in which an eccentric point such as 14 is employed, is that to reduce to a minimum the vertical jump of the spindle 15 it is desirable that the spindle be as nearly as possible normal to the curve being ground rather than at an angle to it. It is for this reason that the member 19 is rotatable within the bracket 20, being locked in desired adjusted position as by the clamp screw 40, while the arm is provided with a collar 41 having the designation 42 to cooperate with the graduations 43 on the bracket 20 denoting the angle of adjustment of the parts.

From the foregoing description taken in connection with the accompanying drawings it will be seen that I have provided a simple desirable grinding machine in which the grinding movement is extremely varied and in which the possibility of the grinding action following definite paths tending to produce waves is entirely eliminated, and a mechanism in which the paths produced may be varied to produce an indefinite number of different paths of grinding by alteration of the speed of movement of one or other of the several parts involved by variation of the relative speeds of the several parts or the amount of throw thereof.

Figures III, IV, V and VI are views giving examples of a few of the many outlines which will be traced by the point 14 when the machine is in operation, and these are simply characteristic of many others, since the machine may be set to work almost entirely on the outer edge of the tool or to in every movement overlap the center from any action therebetween. It will further be understood that the machine may be employed to manufacture any kind of lens either flat or meniscus, sphere, or cylinder, and on account of the improved form of motion imparted to the parts will obtain a very fine surface in a minimum of time.

I claim:

1. The combination with a rotating lens grinding lap, of means operatively connected thereto for driving the lap, a revoluble eccentric pin carrying spindle opposed endwise to the approximate center of the lap, means operatively supporting said spindle and operatively connected with the lap driving means, and acting to shift the spindle in a direction longitudinally of the machine at right angles to the axis of the lap, and means operatively connected to the lap driving means and the spindle supporting means, the latter connection causing the

spindle to shift transversely of the machine at right angles to the axis of the lap.

2. The combination with a rotating lens grinding lap, of means operatively connected thereto for driving the lap, a revoluble eccentric pin carrying spindle opposed endwise to the approximate center of the lap, means operatively supporting said spindle and operatively connected with the lap driving means, and acting to shift the spindle in a direction longitudinally of the machine at right angles to the axis of the lap, means operatively connected to the lap driving means and the spindle supporting means, the latter connection causing the spindle to shift transversely of the machine at right angles to the axis of the lap, the shifting of the spindle causing the eccentric pin to move the lens block in a circuitous path, and means for varying the lateral shifting of the spindle for altering the circuitous path of the lens block.

3. The combination with a rotating lens grinding lap, of means operatively connected thereto for driving the lap, a revoluble eccentric pin carrying spindle opposed endwise to the approximate center of the lap, means operatively supporting said spindle and operatively connected with the lap driving means, and acting to shift the spindle in a direction longitudinally of the machine at right angles to the axis of the lap, means operatively connected to the lap driving means and the spindle supporting means, the latter connection causing the spindle to shift transversely of the machine at right angles to the axis of the lap, the shifting of the spindle causing the eccentric pin to move the lens block in a circuitous path, means for varying the lateral shifting of the spindle for altering the circuitous path of the lens block, and means for resiliently actuating the spindle in the direction of the lap, whereby the eccentric pin will bear yieldably upon the lens block.

4. The combination with a rotating lens grinding lap, of means operatively connected thereto for driving the lap, a revoluble eccentric pin carrying spindle opposed endwise to the approximate center of the lap, means operatively supporting said spindle and operatively connected with the lap driving means, and acting to shift the spindle in a direction longitudinally of the machine at right angles to the axis of the lap, means operatively connected to the lap driving means and the spindle supporting means, the latter connection causing the spindle to shift transversely of the machine at right angles to the axis of the lap, and means for resiliently actuating the spindle in the direction of the lap, whereby the eccentric pin will bear yieldably upon a lens block.

In testimony whereof I have affixed my signature.

ALBERT E. MAYNARD.