

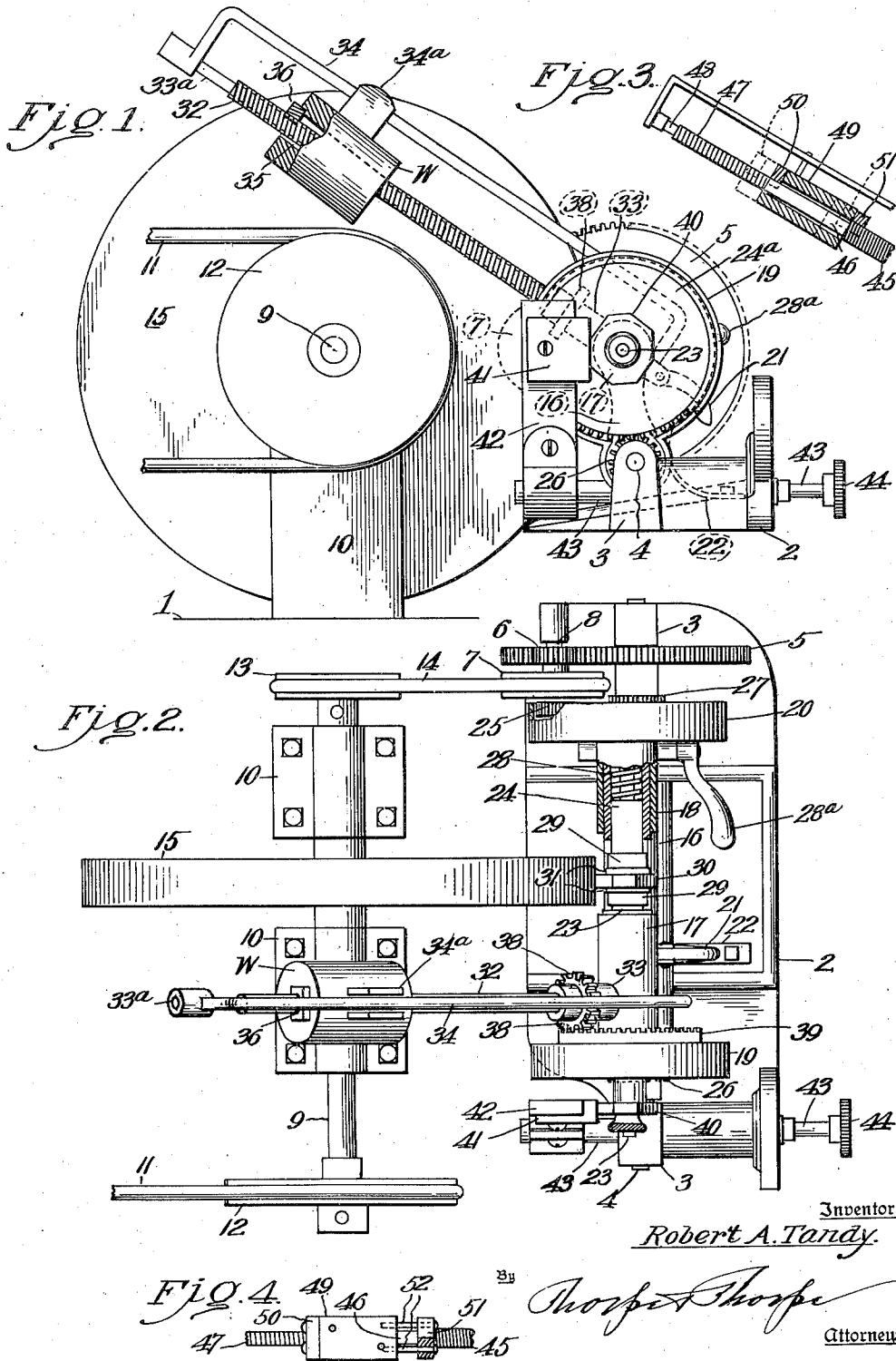
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LENS EDGE-GRINDING MACHINE

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LENS EDGE-GRINDING MACHINE

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This invention relates to lens edge-grinding machines and has for its object to produce means for progressively increasing the pressure between the lens and the abrasive or grinding element, up to a desired maximum. In the edge grinding of lenses, when they are first brought into contact with the abrasive element, they frequently have more or less rough peripheries with sharp spicules of glass. If excessive pressure is placed on the lens periphery, the glass may fracture, crack or spawl, and the lens be ruined. However, for rapid grinding, to lessen the overall time of the operation and therefore its cost, it is essential that the lens be subjected to the maximum pressure as quickly as possible after the grinding operation starts.

A prime object of the invention, therefore, is to produce means for progressively increasing the pressure between the edge grinding abrasive and a lens, which is entirely automatic and needs no attention by the operator, the apparatus being of such nature as to avoid breakage, flaking or chipping of the edges of the lenses being ground.

A further object of the invention is to produce a weight control or force applying means for edge grinding machines of that type involving a swinging or rocking pressure frame or support, of such nature it is not likely that the operator will carelessly leave the weight at its limit and permit it to forcibly impel the lens against the abrasive at the commencement of a grinding operation. This is a prolific source of damage at the present time.

With the general objects named in view, and others as will hereinafter appear, the invention consists in certain novel and useful features of construction and organization of parts as hereinafter described and claimed; and in order that it may be fully understood, reference is to be had to the accompanying drawing, in which:

Figure 1 is a side view of one form of grinding apparatus embodying the invention.

Figure 2 is a top plan view of the same, partially broken away to disclose parts otherwise hidden.

Figure 3 is a fragmental section through a modified form of construction in which the force-means or weight, initially travels slowly, say for approximately one-third of its course, and then travels more rapidly so that full pressure will be applied only after a sufficient time interval to insure removal of the sharp or high points on the lens edge.

Figure 4 is a fragmental top plan view of the device as shown in Figure 3, with certain parts

omitted and with the slow speed clutch element having just passed out of driving engagement with the low pitch threads on the driven worm shaft.

In the said drawing, where like reference characters identify corresponding parts in all of the figures, 1 indicates a table or bench for the support of the grinding equipment which may be of any type, but preferably involves a rotating grinding abrasive wheel and mechanism for turning and yieldingly pressing and holding a lens with its edge in engagement with the abrasive member or grinding wheel.

The preferable arrangement is shown in the drawing, in which 2 is a bed plate having a pair of end bearings 3 for a shaft 4. Keyed to one end of the shaft 4 is a gear wheel 5 in mesh with a gear pinion 6 turning with a pulley 7, the latter and the pinion 6 being journaled on a suitably supported stub-shaft 8. A shaft 9, paralleling shaft 4, is mounted in bearings 10 rising from the table 1, and said shaft 9 is driven by a drive belt 11 and a pulley 12, and upon the other end of the shaft 9 is a belt pulley 13 connected by a belt 14 with the pulley 7. The shaft 9 also carries a grinding wheel or disk 15 which may be mounted to have limited reciprocatory travel longitudinally of shaft 9, if desired. Means, not shown, are provided to maintain the grinding wheel properly moistened.

Mounted on the shaft 4 between bearings 3 is a rock-frame 16, which oscillates around the axis of the shaft independently of the rotation thereof. The frame 16 is equipped with a pair of up-standing spaced bearings 17 and 18, formed at their remote ends with relatively large circular housings 19 and 20 respectively. To hold the rock frame in its retracted or inoperative position, it carries a pivoted gravity latch 21 for engagement with a spring catch 22 secured to the bed plate. Axially aligned spaced shafts 23 and 24 are respectively journaled in bearings 17 and 18, and said shafts carry, within the housing 19 and 20, gear wheels 24a and 25, in mesh respectively, with gear pinions 26 and 27 keyed to the shaft 4. The arrangement is such that power imparted to gear wheel 5 from the belt 14 through the parts described, operates shaft 4 and hence shafts 23 and 24, regardless of the rocking movement of the frame 16.

The shafts 23 and 24 constitute one form of lens-holding means, and, as shown, shaft 24 is slidably fitted in bearing 18 and is urged toward shaft 23 by a spring 28, said spring being controlled by a manually operable cam-actuating

handle 28a. Lens clamp blocks or chucks 29 are detachably related to the opposed ends of the shafts 23 and 24 to clamp on opposite sides of a lens 30 to be ground, said blocks preferably having compressible disks 31 for direct engagement with the lens to guard against slippage thereof. To rock the lens edgewise against the grinding wheel or abrasive surface 15, the rock frame 16 has an overbalancing weight W at the side adjacent the grinding wheel. In the initial part of the grinding action, it is undesirable to subject the edge of the lens to too much pressure as its edge is likely to be more or less ragged and uneven, but as the grinding action progresses, it is desirable to increase or intensify the pressure in proportion to the grinding operation, up to a desired maximum pressure depending upon the hardness of the parts in grinding contact and the non-slipping characteristics of the clutch holding the lens.

To effect a gradual and continuing increase in the pressure of the lens on the grinding wheel, a worm shaft 32, which constitutes a lever arm tending to effect approaching movement of the lens and the grinding wheel, is journaled at its lower end in a boss 33 on the rock frame 16. The upper end of the shaft 32 is reduced to form an unthreaded extremity 33a which is journaled in the upper end of a supporting arch 34 overlying the worm shaft and secured firmly at its lower end to the rock frame 16 to partake of the rocking movement of the latter and of the worm shaft. The weight W has ears 34a fitting on opposite sides of the arch 34 to prevent rotation of the weight around the axis of the worm shaft and also to act as handles in returning the weight to initial position as will hereinafter appear. The weight W is formed with an internal bore 35 of greater diameter than that of the worm shaft 32, and at its upper end, the bore is fitted with a fixedly mounted half-nut or clutch element 36 for threaded engagement with the threads of the worm shaft so that as the latter revolves in the proper direction, the weight is caused to travel toward the upper end of the worm shaft, thus progressively and uninterruptedly increasing the pressure of said worm shaft or lever arm 32. The shaft may be driven in any suitable way in timed relation to the lens grinding operation, such as by the intermeshing of a pinion 38 with the teeth of a flat-face gear 39 secured to or forming a part of the gear 24a keyed on the shaft 23. The shaft 32 and its weight W constitute a yielding means for uninterruptedly increasing the pressure of the lens on the grinding wheel.

The parts are so proportioned that by the time the lens has been ground down to the approximate size and shape desired, the half-nut 36 will just about have cleared the uppermost thread on the worm shaft 32. When this point is reached, the weight as a whole rocks and the nut drops down onto the smooth reduced upper end 33a of the worm shaft because the bore 35 through the weight is of greater diameter than the said shaft. Weight is held in this position regardless of the continued rotation of the shaft since the rear face of the half-nut rides on the shoulder formed by the reduced end of the shaft. Obviously, before starting the grinding of another lens, the operator through grasping the ears 34a reversely rocks the weight until the threads of the half-nut clear the worm threads, when the weight assembly can be slid down the shaft; and when the operator releases the weight

the threaded members will be reengaged for a repetition of the operation described.

To avoid excess grinding of the lens and to properly contour it, a template 40 of the shape lens desired, is clamped on the shaft 23 to turn therewith. The template rocks with the frame 16 until the former contacts a limiting plate or guide 41 carried by an upstanding arm 42 secured to a longitudinally adjustable rod 43, whose position is controlled by hand-wheel 44. Through adjustment of the pattern abutment 41, the size of the lens of desired contour, is controlled. The particular template shown is of octagonal shape to produce a lens of corresponding outline, but, of course, the template might be elliptic in outline or of any other desired shape.

In Figures 3 and 4, a modified construction is illustrated whereby the force-means or weight initially travels at slow speed, a sufficient length of time to allow for the grinding off of sharp edges on a lens, and then the weight travels much faster to full force-applying or pressure position. In these figures, the worm shaft is illustrated as being divided into sections, namely, an initial or slow speed section having low pitch threads 45, an unthreaded section 46, a section for high speed having high pitch threads 47, and a final or terminal reduced unthreaded portion 48 which corresponds in function to the same portion 33a of Figures 1 and 2.

The weight 49 in this embodiment of the invention, instead of having a clutch nut at only one end, has clutch nuts at both ends, namely, a clutch nut 50 at its upper end to engage the threads 47, and a nut 51 at its lower end to engage the threads 45. From a consideration of the description and as shown in Figures 3 and 4, it will be clear that the half-nut 50 will move the weight upwardly more rapidly than the half-nut 51, and that means must be provided to permit of the increased speed of travel of the weight without dragging the lower half-nut on its threads 45. To accomplish this result and to tie the drive mechanism together as a unit, the lower nut 51 is formed with a pair of openings in sliding engagement with a pair of headed pins 52 projecting from the lower end of the weight, the heads of said pins preventing disengagement of the nut. In operation, at the starting position, the nut 51 engages the threads 45, and nut 50 is riding on the unthreaded portion 46 of the worm shaft. Thus the weight is initially driven at a speed in proportion to the rotation of the shaft and the pitch of the thread 45.

Obviously, the lower nut must drive the weight upwardly, until the upper nut 50 engages its threads 47, see Figure 3. As soon as this engagement occurs, the weight commences to move faster than the nut 51. The pins 52 allow this differential movement so that the lower nut 51 runs off the upper end of its threads 45 without being pulled or dragged over said threads, see Figure 4. Thus, the nut 51 moves to the unthreaded portion 46 of the worm shaft before the heads of the pins 52 start to pull on said half-nut. From this point onward the operation of the device is the same as described in connection with Figures 1 and 2. It will be apparent that with this construction the weight or force-means travels up the worm in two cycles bearing a different time ratio to each other and to the rate of the lens grinding operation.

From the above description, it will be apparent that I have produced a construction embodying

the features of advantage set forth as desirable, and while I have described and illustrated the preferred embodiment, it is to be understood that I reserve the right to all changes within the spirit of the invention and without the ambit of the prior art.

I claim:

1. In a lens edge-grinding machine, an abrasive element, a support mounted to move toward and from the abrasive element, a shaft journaled in the support and adapted to carry a lens to be edge ground, a lever arm projecting from the support and tending to move said support toward the abrasive element, a weight on said lever arm, and means driven by the rotating shaft to effect progressive shifting of the weight on the lever arm during a lens grinding operation to increase the force of the lever arm.

2. In a lens edge-grinding machine, an abrasive element, a support mounted for movement toward and from the abrasive element, a shaft journaled in the support and adapted to carry a lens to be edge-ground, a worm shaft journaled in the support and driven by the first-named shaft and mounted to constitute a lever arm tending to effect approach of the abrasive element and support, and a weight on the worm shaft to be moved by rotation of the latter during a lens grinding operation to uninterruptedly increase the force with which the worm shaft tends to effect approach of the abrasive element and support.

3. In a lens edge-grinding machine, an abrasive element, a support mounted for movement toward and from the abrasive element, a shaft journaled in the support and adapted to carry a lens to be edge-ground, a worm shaft journaled in the support and forming a lever arm tending to effect approach of the abrasive element and support, a weight translated by the worm shaft on rotation of the latter to uninterruptedly increase the force with which the worm shaft tends to effect approach of the abrasive element and support, and an abutment to prevent rotation of the weight around the axis of the worm shaft.

4. In a lens edge-grinding machine, an abrasive element, a support mounted for movement toward and from the abrasive element, a shaft journaled in the support and adapted to carry a lens to be edge ground, a worm shaft journaled in the support, and a weight interclutched with the worm shaft to be translated on rotation thereof to increase the force tending to move the support toward the abrasive element, said weight and worm having cooperating portions to retain the weight at one end of its travel after it has passed beyond the threaded portion of the worm shaft.

5. In a lens edge-grinding machine, a rotating grinding wheel, a support, said wheel and support being mounted for relative approaching and receding movement, a shaft journaled in the support and adapted to carry a lens to be edge-ground, a template turning with the shaft for limiting approaching movement of the support and grinding wheel, yielding means tending to approach said support and grinding wheel, and means to uninterruptedly increase the force of said yielding means, from a minimum to a maximum, in cooperation with the lens edge-grinding operation.

6. In a lens edge-grinding machine, an abrasive element, a lens support, said element and support being mounted for relative approaching and receding movement, a shaft journaled in the support and adapted to rotate a lens to be ground, and yielding means operative in timed relation to

the lens grinding operation, said yielding means uninterruptedly increasing its pressure, from a minimum to a maximum, in staged cycles bearing different timed relations to the lens grinding operation.

7. In a lens edge-grinding machine, an abrasive element, a support, said element and support being mounted for relative approaching and receding movement, a shaft journaled in the support and adapted to rotate a lens to be edge ground, a worm shaft lever arm journaled in the support and driven in timed relation to the first-named shaft and exerting force tending to effect approach of the abrasive element and support, said worm shaft also having a plurality of threaded sections of different pitch, weight to be moved by said worm shaft, and a plurality of clutch elements associated with the weight, each clutch element cooperating with a predetermined threaded area of the worm shaft to effect travel of the weight.

8. In a lens edge-grinding machine, an abrasive element, a support, said element and support being mounted for relative approaching and receding movement, a shaft journaled in the support and adapted to rotate a lens to be ground, a worm driven by said shaft and constituting a lever arm tending to effect approach of the abrasive element and support, said worm shaft having a pair of threaded sections of different pitch, a weight to be moved along the worm shaft, and a pair of clutch elements carried by said weight, one in engagement with each of the threaded sections of the worm, for moving said weight to increase the force with which the worm shaft tends to effect approach of the abrasive element and support.

9. In a lens edge-grinding machine, an abrasive element, a support mounted to rock toward and from said abrasive element, a shaft journaled in the support and adapted to carry a lens to be edge ground, a lever arm projecting from the support and tending to rock same toward the abrasive element, a weight movable on said lever arm, and means to uninterruptedly move the weight on said arm during a lens grinding operation to uninterruptedly increase the force of said lever arm tending to rock the support toward the abrasive element.

10. In a lens edge-grinding machine, an abrasive element, a lens-holding element adapted to hold a lens and to constantly shift the peripheral point of the lens presented for contact with the abrasive element, said elements being mounted for relative approaching and receding movement, yielding means tending to effect approach of said elements to press the lens against the abrasive element, and means to uninterruptedly increase the force from a minimum to a maximum, of said yielding means during the lens grinding operation.

11. In a lens edge-grinding machine, an abrasive element, a support, said abrasive element and support being mounted to move toward and from each other, a shaft journaled in the support and adapted to carry a lens to be ground, yielding means tending to effect approaching movement of the abrasive element and support to press the lens against said abrasive element, and means actuated in timed relation to the shaft to uninterruptedly increase the force from a minimum to a maximum, of said yielding means during a lens grinding operation.

12. In a lens edge-grinding machine, an abrasive element, a driven shaft, a support on said shaft for rocking movement independently of the

rotation of the shaft, a lens-driving shaft jour-
naled in the support, drive means connecting the
lens-driving shaft to the first shaft, yielding
means tending to rock the support toward the
5 abrasive element to press the edge of the lens
against said abrasive element, and means to un-
interruptedly increase the force applied by the
yielding means concurrently with the lens grind-
ing operation.

10 13. In a lens edge-grinding machine, an abra-
sive element, a support mounted to move toward

and from the abrasive element, a shaft journaled
in the support and adapted to carry a lens to be
edge-ground, a template turning with the shaft
for limiting movement of the support toward the
abrasive element, yielding means tending to move
5 the support toward the abrasive element to press
the edge of the lens against said abrasive element,
and means to uninterruptedly increase the force
applied by the yielding element during a lens
grinding operation.

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