June 14, 1955 P. OKEY 2,710,496

MACHINE FOR GRINDING THE EDGE OF A LENS

Filed Oct. 11, 1954 3 Sheets-Sheet 1

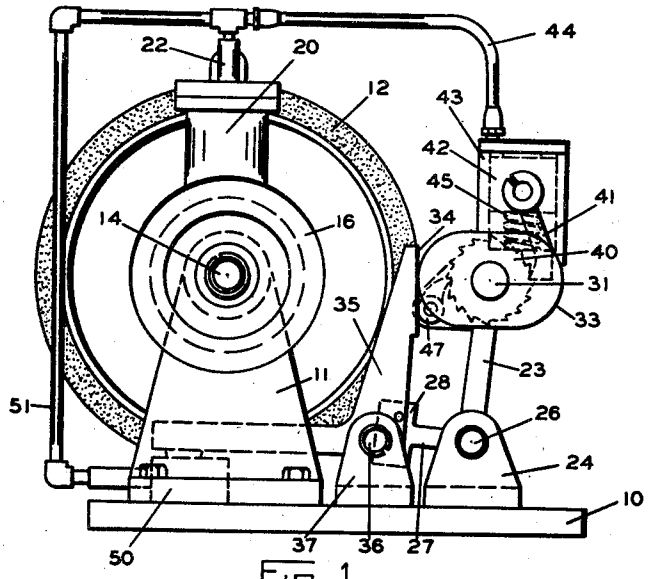


Fig. 1

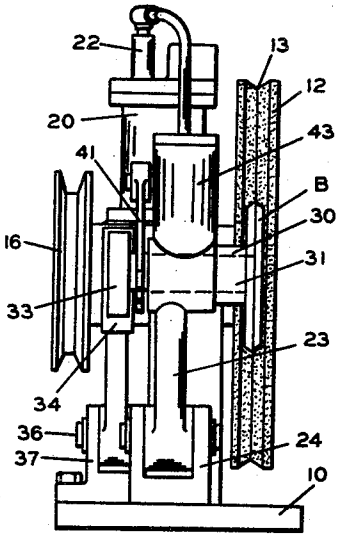


Fig. 2

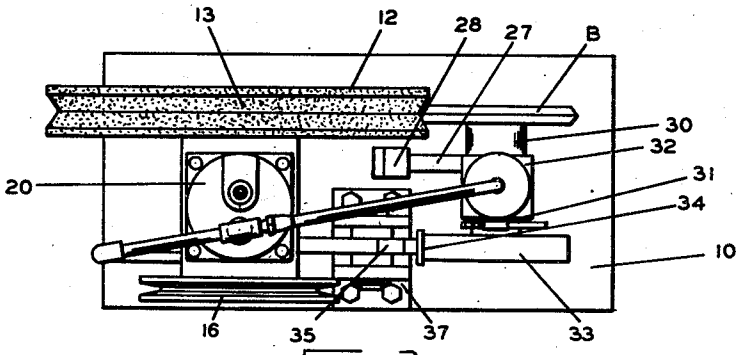


Fig. 3

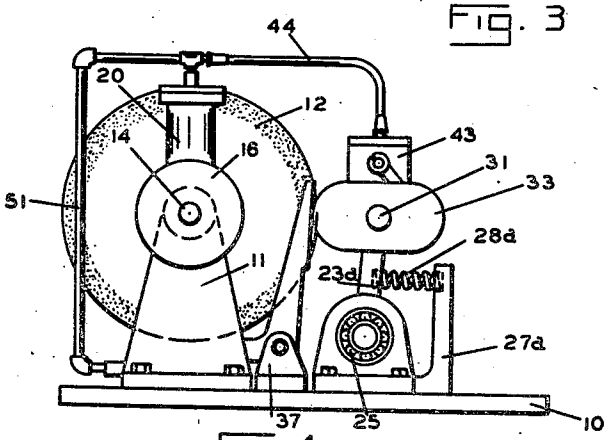


Fig. 4

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MACHINE FOR GRINDING THE EDGE OF A LENS

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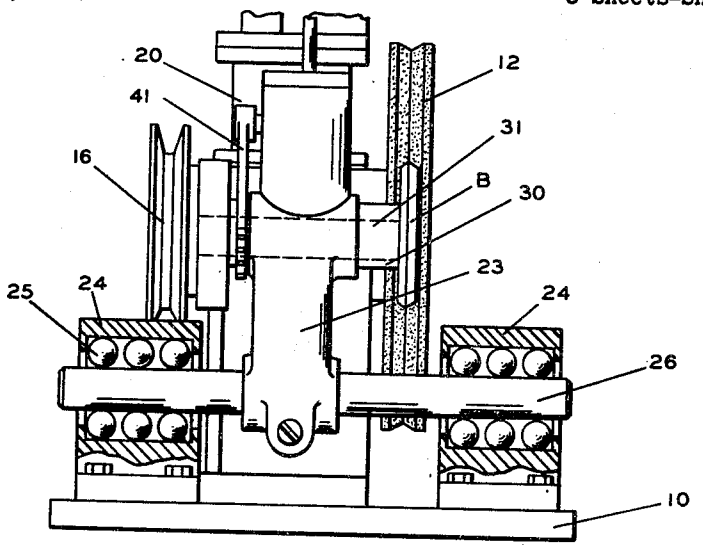


Fig. 5

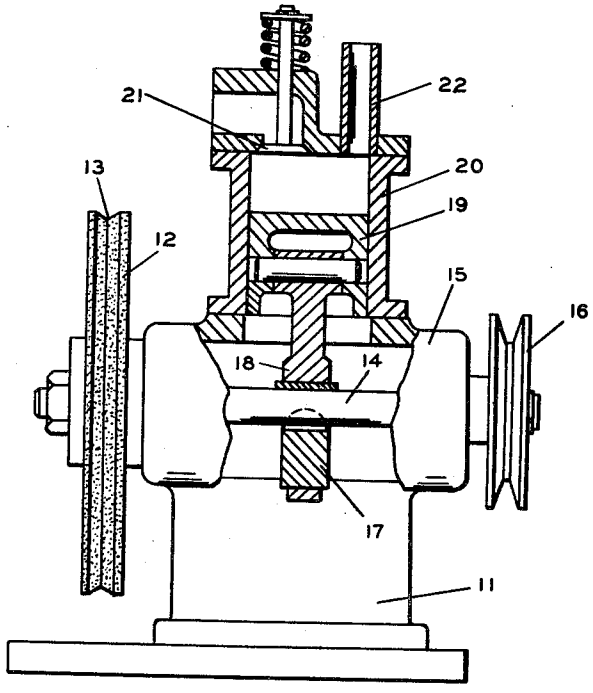


Fig. 6

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MACHINE FOR GRINDING THE EDGE OF A LENS

Filed Oct. 11, 1954 3 Sheets-Sheet 3

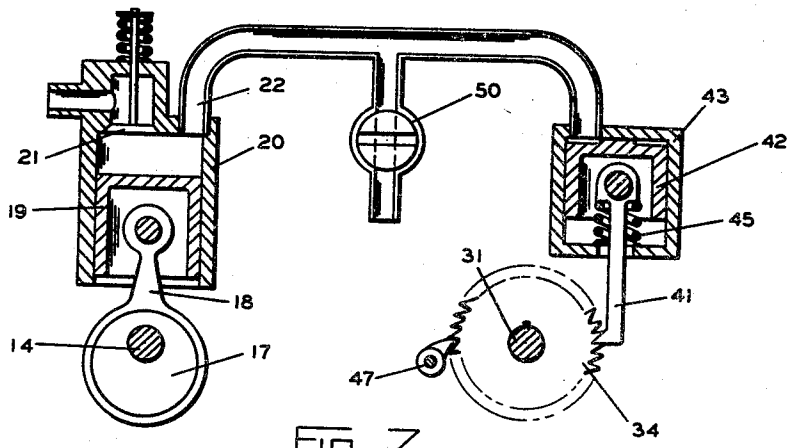


Fig. 7

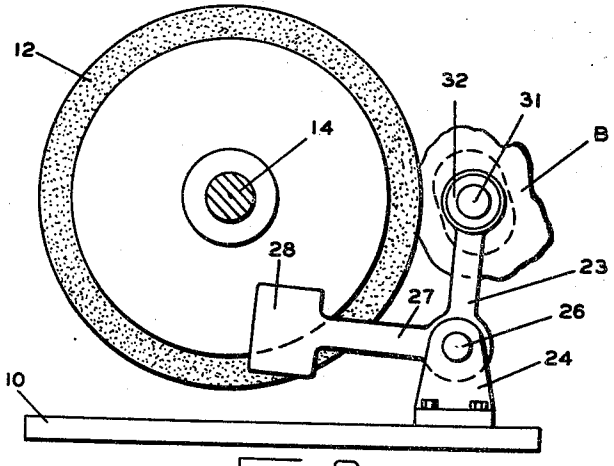


Fig. 8

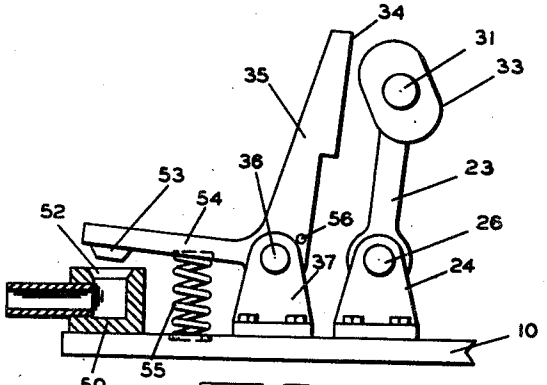


Fig. 9

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United States Patent Office 2,710,496
Patented June 14, 1955

2,710,496

MACHINE FOR GRINDING THE EDGE OF A LENS

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Application October 11, 1954, Serial No. 461,324
5 Claims. (Cl. 51—101)

This invention relates to a machine for grinding the edge of a lens. It has to do, more specifically, with a machine for grinding a lens either to a circle or some other outlines such as are used in spectacle frames.

Various types of machines have been provided in the past and are in use at the present time for this purpose. However, these machines are usually very complicated and costly. Prior art machines usually include an abrasive wheel and means for supporting the rough lens blank on a spindle so that its edge is in contact with the grinding edge of the abrasive wheel. The abrasive wheel is driven on its axis by suitable means and means is usually provided for driving the lens blank supporting spindle about its axis so as to subject different portions of the edge of the blank successively to the grinding action of the abrasive wheel. Provision is made for angular movement of the spindle to rock the lens blank against the abrasive wheel to grind the lens blank to size and this rocking movement is generally controlled by a pattern cam also keyed to the spindle and associated with a suitable relatively fixed follower.

In the better types of machines as now constructed, provision is made to stop rotation of the spindle when a high point on the lens blank edge contacts the abrasive wheel, and to hold it stationary until the high point is ground off at the same time the spindle is rocked towards the abrasive wheel to keep the edge of the blank in contact therewith. This procedure considerably lessens the time to completely edge a lens. All machines now made have extremely complicated systems of gears and pivots to stop rotation of the lens blank when desired and to keep it in proper contact with the wheel, and it is the purpose of this invention to eliminate such complication and to bring about the same result through simple mechanical methods.

Some lenses require a double bevel on their edges and for this purpose an abrasive wheel with a channel or groove of V-cross section is provided in prior art machines. In grinding a double bevel on the periphery of a lens blank having spherical curves and a non-circular contour, the apex of the bevel will not lie in a plane, hence provision must be made to permit axial movement of the spindle which carries the lens blank so that its edge will be properly positioned axially of the wheel during its rotation. It is another purpose of this invention to greatly simplify the system for keeping the lens blank properly positioned axially of the wheel and with its edge in proper contact with the wheel.

In the accompanying drawings, I have illustrated a preferred embodiment of my machine. In these drawings:

Figure 1 is a side elevational view of a machine made according to my invention.

Figure 2 is an end view of the structure shown in Figure 1.

Figure 3 is a plan view of the machine.

Figure 4 is a view similar to Figure 1 but showing a slight modification of the machine.

Figure 5 is a view similar to Figure 2 but enlarged and broken away to show in detail the mounting for the spindle which carries the cam and the lens blank.

Figure 6 is an end view of the opposite end of the machine, partly broken away, to show the pulsating pump used in the machine as the means for rotating the lens blank spindle.

Figure 7 is a diagrammatic view illustrating the pulsating air system for rotating the lens blank and associated pattern cam.

Figure 8 is a diagrammatic view showing the lens blank in contact with the abrasive wheel.

Figure 9 is a diagrammatic view showing the action of the valve operating lever which controls the pulsating air system of the machine.

With reference to the drawings and especially to Figures 1 to 6, I have illustrated my machine as comprising a base **10** which carries at one end the pedestal **11** which supports the grinding or abrasive wheel **12**. This wheel may be of any suitable type and is shown as having a channel **13** of V-cross section in its peripheral edge so that it will grind a double bevel on the edge of the lens as will later appear. The wheel **12** (Figure 6) is removably mounted on the end of a transverse shaft **14** which is carried in a sleeve-like housing **15** on the pedestal **11** and projects from each end thereof. The opposite end of the shaft **14** has keyed thereon a driving pulley **16** which may be driven from any suitable source of power.

Within the housing **15**, the shaft **14** has keyed thereon an eccentric **17** which is rotatable within a bearing on the lower end of a connecting rod **18** that has its upper end pivoted to a piston **19**. This piston **19** is mounted for vertical reciprocation in the cylinder **20** which is mounted on the pedestal **11** and continues upwardly from the sleeve-like housing **15**, the rod **18** extending upwardly into the cylinder **20** through an opening in the upper side of the housing **15**. The upper end of the cylinder **20** is provided with an inlet valve **21** and with a pressure line connection **22**.

As shown best in Figures 1 and 3, the lens blank supporting system for supporting the blank B in association with the abrasive wheel **12** includes a rockable arm **23** mounted on bearing structures **24** for rocking movement about an axis parallel to but spaced longitudinally of the base **10** and at a lower level relative to the axis of the wheel **12**.

As shown in Figure 5, a pair of bearing structures **24** are provided and are bolted in transversely spaced relationship to the base **10**. Each bearing structure comprises a plurality of balls **25** arranged around a pivot or rock shaft **26**. This shaft **26** is mounted both for rotative and axial movement in the bearing structures **24** as indicated. The arm **23** is keyed on the rock shaft **26** and is provided with a weight-carrying arm **27** which extends towards the wheel axis and carries a counterweight **28** on its outer end. This weight tends to rock the arm **23** towards the wheel **12**.

As shown in Figure 4, instead of providing the weight **28** for rocking the arm **23** towards the wheel **12**, a spring **28***a* can be provided. This spring will be a compression spring engaging the outer side of the arm **23***a* and a fixed upstanding arm **27***a* so as to force the rockable arm **23***a* towards the wheel **12**.

The lens blank B to be edged is often roughly cut, as shown in Figure 8, and is mounted by cementing or other suitable means on a holder **30** (Figures 2, 3 and 5) which is removably keyed or splined on one end of a transverse spindle or shaft **31** which is rotatably mounted in a bearing sleeve **32** formed in the upper end of the rockable arm **23**. The lens blank B will always be in the same vertical plane as the wheel **12**, as will later appear, and will be in yielding engagement with the edge thereof. A pattern cam **33** is removably keyed or splined on the opposite end of the shaft **31**. This cam **33** is of the identical outline and size to which it is desired to edge the rough lens blank B. The cam **33** cooperates with a stop follower surface **34** formed on the upper end of a rockable valve-operating arm **35** which is of L-form being pivoted at its angle at **36** in a bifurcated bracket **37** which is locked to the base **10** between the pedestal **11** and the

bearing structures 24. The rockable arm 35 is disposed adjacent the forward edge of the base 10 and the surface 34 thereof is relatively wide to permit the necessary limited axial movement of the cam 33 while still maintaining contact between the cam and the stop surface.

It is necessary that the lens spindle 31 be rotated so as to advance the edge of the lens blank B into contact with the edge of the abrasive wheel 12. This is accomplished with a ratchet mechanism shown in Figures 1 to 3. This ratchet mechanism comprises a ratchet gear 40 keyed on the lens spindle adjacent the cam 33. This ratchet gear 40 is engaged by a dog 41 which has its upper end pivoted to a piston 42 which is mounted for vertical movement in a cylinder 43 formed in the upper end of the rockable arm 23. Obviously, vertical movement of the piston 42 will rotate the ratchet gear 40 and the spindle 31 step-by-step. This will turn the lens blank B and the cam 33, carried by the spindle, simultaneously. The piston 42 is urged towards its upper position by a compression spring 45 which is mounted in the lower end of the cylinder 43. Reverse rotation of the ratchet gear 40 is prevented by a locking dog 47.

The piston 42 is reciprocated by action of the cylinder 20 and piston 19 (Figure 7) which serve as a pulsating air pump. The cylinder 20 is connected to the cylinder 43 by a flexible pressure line 44 which is connected to the top of the cylinder 43 and to the fitting 22 on the top of the cylinder 20. Pulsating air pressure will be applied to cylinder 43 whenever the machine is operating since the driver shaft 14 drives the pulsating pump of which the cylinder 20 is a part. Thus, the lens spindle will be rotated by the pulsating pump and the ratchet mechanism. The arm 23 can be rocked about the pivot shaft 26 by the cam 33 following the stop surface 34, the flexible conduct 44 permitting this, and the shaft 26 can move axially freely to permit the edge of the lens blank B to stay centered in the groove 13 of the abrasive wheel 12.

I also provide an arrangement to stop rotation of the lens spindle when a high point on the lens blank B contacts the abrasive wheel 12 and to hold it stationary until the high point is removed by the abrasive wheel. This structure is shown in Figures 1 and 9 and comprises a control valve 50 mounted on the base 10 and operated by the rockable arm 35 to control the pulsating air system of the machine. The function of this valve is illustrated diagrammatically in Figure 7.

The valve 50 is connected to the pressure line 51 (Figure 1) which is connected to the fitting 22 on the cylinder 20. It includes a seat 32 (Figure 9) upon which a valve closure 53 is adapted to seat. This closure is carried on the lower part 54 of the arm 35 and is normally unseated by means of a compression spring 55 which is provided between the arm portion 54 and the base 10 and which also tends to keep the stop surface 34 in contact with the cam 33. A stop pin 56 on the arm 35 engages the bracket 37 to limit the extent of the swinging movement of the arm towards the arm 23. Thus, when a high point on the lens blank B contacts the wheel 12, as shown in Figure 8, the arm 23 will be swung away from the wheel which will move the cam 33 away from the stop surface 34, and will permit the spring 55 to rock the arm 35 so as to open the valve 50. Since the pressure line of the pulsating air system will now be open to the atmosphere, the pulsating effect on the piston 42 will be eliminated and the spindle 31 will stay in a fixed position. The lens blank will therefore remain fixed until the high point on its edge is ground off sufficiently to permit the cam 33 to engage the stop 34 and swing the arm 35, against the force of the spring 55, into such a position that valve 50 again is closed. Then the pulsating air system will again be effective to rotate the lens. The action of the pulsating air system is schematically indicated in Figure 7 but it is to be understood that the valve 50 is not shown in its actual position relative to the other elements.

It will be apparent from the above that I have provided an edge grinding machine in which a very simple system is used for advancing the lens blank relative to the grinding wheel, stopping its rotation when a high point is reached until it is ground off, and moving the lens blank axially relative to the grinding wheel.

Various other advantages will be apparent.

Having thus described my invention, what I claim is:

1. A lens grinding machine comprising an abrasive wheel mounted for rotation about a fixed axis, means for driving said wheel about said axis, a lens blank spindle for supporting a lens blank with its edge in contact with said wheel and a cam in cooperation with a relatively fixed follower, means for mounting said spindle so that its axis is parallel to said axis of said wheel, said means including a pivot structure which permits both angular and axial movement of said spindle relative to said wheel, said cam controlling said angular movement, means for rotating said spindle and comprising ratchet mechanism associated with the spindle, pneumatic means for operating said ratchet mechanism to rotate the spindle, and means for interrupting rotation of said spindle whenever the spindle is rocked away from the wheel axis by a high point on the blank engaging the wheel.

2. A machine according to claim 1 in which said pneumatic means comprises a pulsating pump driven by a shaft on which said wheel is mounted and connected by a pressure line to a pressure-actuated unit which actuates said ratchet mechanism, and said means for interrupting rotation of the spindle comprises a valve which controls said pressure line and is actuated upon movement of said spindle away from the axis of said wheel to a predetermined extent.

3. A lens grinding machine comprising an abrasive wheel which is grooved, a driven shaft having a fixed axis and upon which said wheel is mounted, a rockable arm pivoted on an axis parallel to said fixed axis, a spindle mounted on said arm and adapted to support a lens to be ground and a cam pattern in axially spaced relationship thereon, means normally rocking the arm towards the wheel axis so that the lens blank will engage the wheel, a relatively fixed cam follower with which the cam on the spindle will normally engage but which is carried by a second rockable arm for limited yielding movement under the influence of the cam, pneumatic means for rotating said spindle, a valve for controlling said pneumatic means and operated by said second rockable arm, said spindle-supporting arm being movable axially of the wheel axis to permit proper axial movement of the lens blank spindle so that the edge of the lens blank will always be properly associated with the groove in the wheel, a ratchet wheel carried by said spindle, said pneumatic means including a piston and cylinder unit carried by said spindle-supporting arm for rotating said ratchet wheel.

4. A machine according to claim 3 in which the pneumatic means includes a pulsating pump driven by the shaft which carries said wheel, and said valve serves to vent a pressure line connected between said pump and said cylinder and piston unit to prevent actuation of said cylinder and piston unit.

5. A machine according to claim 4 in which the valve comprises a seat, a valve member carried by said valve-operating rockable arm, and yieldable means acting in said arm and tending to move the valve member off its seat.

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