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CONTROLLING MEANS FOR LENS EDGING MACHINE

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2 Sheets-Sheet 1

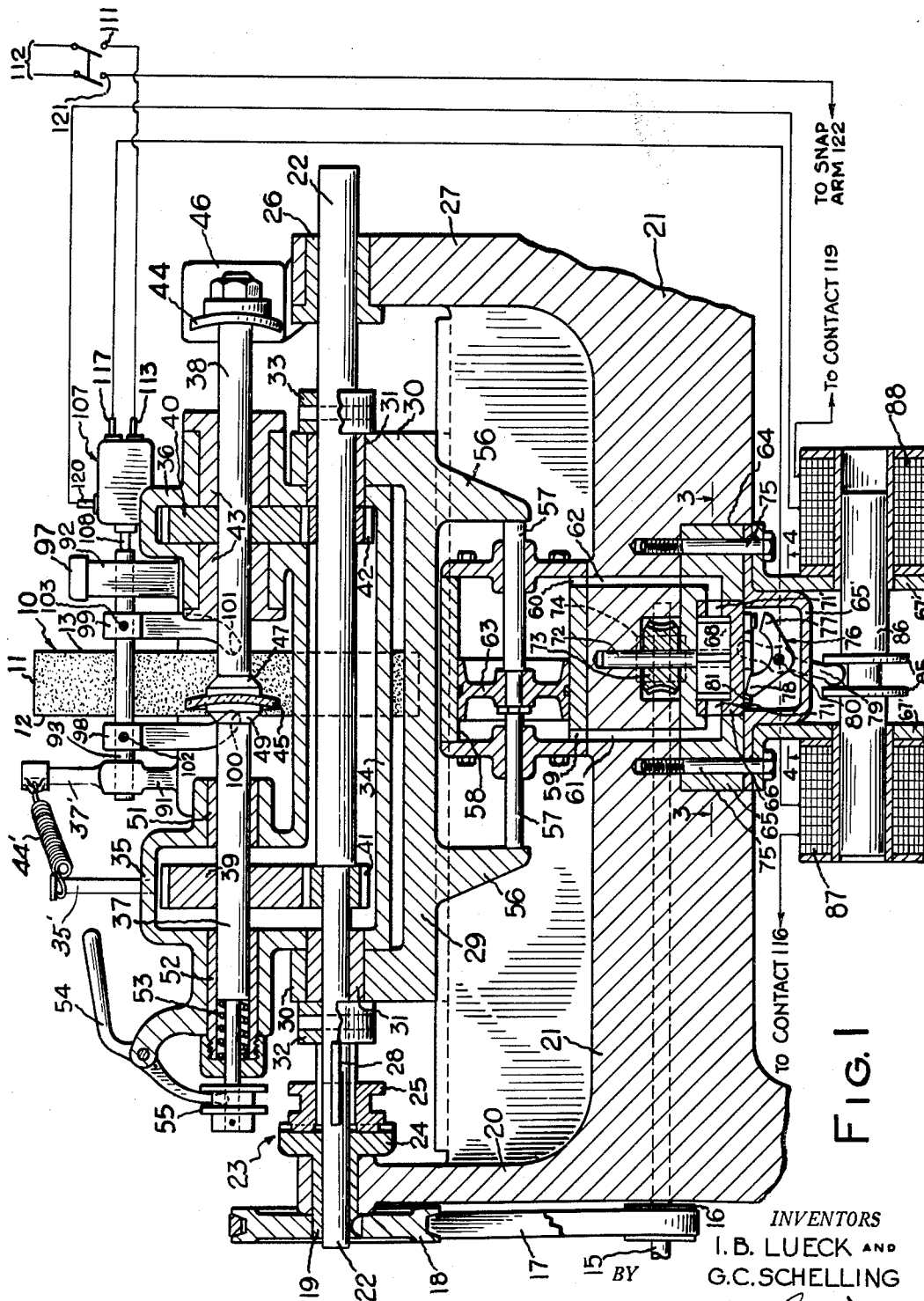


FIG. 1

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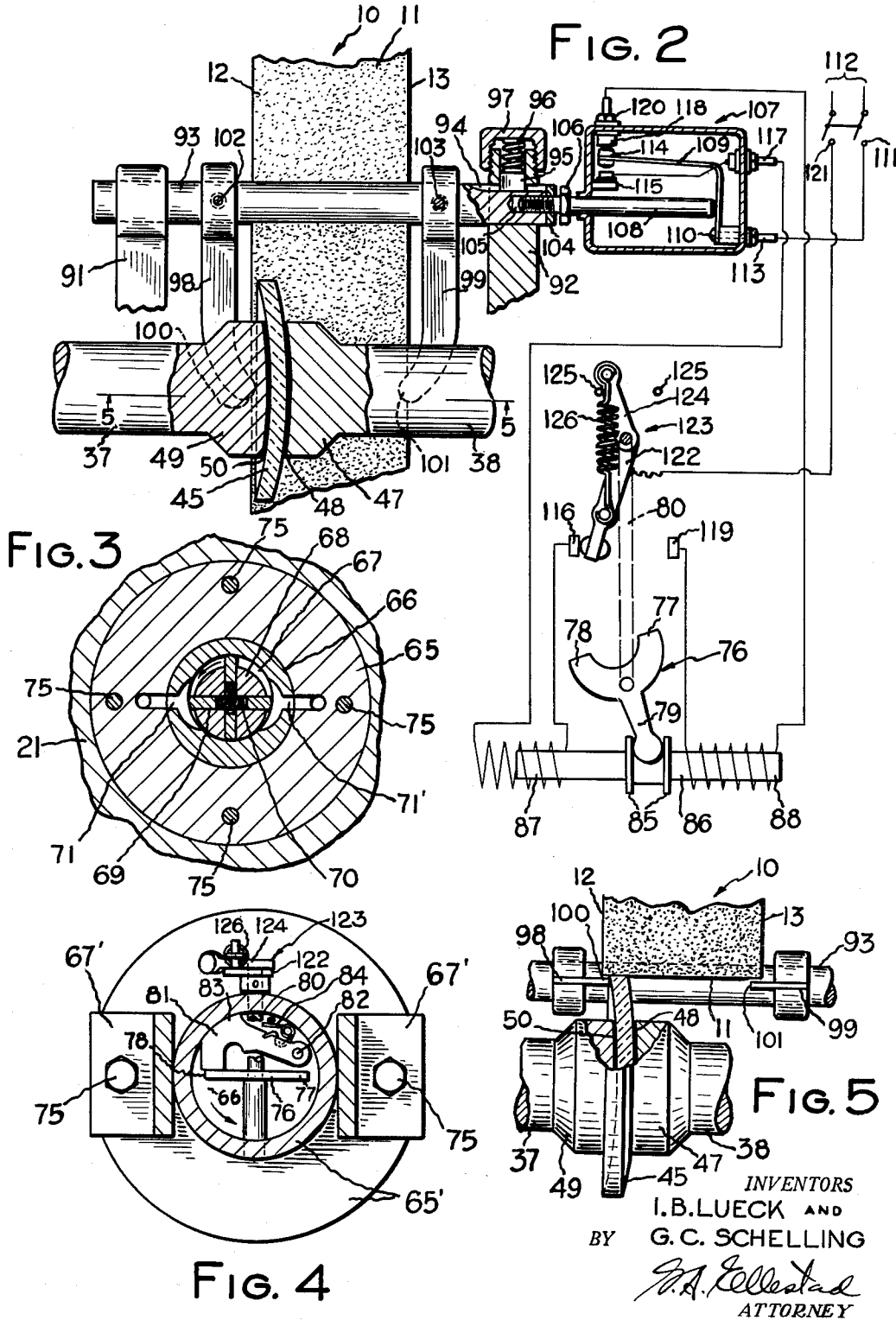
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CONTROLLING MEANS FOR LENS EDGING MACHINE

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8 Claims. (Cl. 51—101)

This invention relates to improvements in a lens edging machine and more particularly it has reference to a novel device for substantially increasing the effective working area of a lens edging wheel.

In prior lens edging machines, the face of the grinding wheel is not worn down uniformly and hence, after some use, ledges of abrasive are formed at the boundaries thereof. These ledges of abrasive perform no useful grinding function and due to their protrusion above the regular grinding face many lenses are broken. Attempts have been made to minimize this wasted grinding area by providing the grinding machines with adjustments on the grinding wheel or on the moving lens carriage so that the edge of a lens would be moved across the entire grinding face. These adjustments required that for each lens of different thickness a different setting be made so as to vary the relative movement between the grinding wheel and the lens carriage to permit the lens to travel substantially to the boundaries of the grinding face. However, because of the time consumed and the bother involved, the operators usually neglect to make such adjustments with the result that the grinding wheel is not worn down uniformly across its grinding face.

It is, therefore, an object of this invention to provide a machine for edging lenses that will overcome the above-mentioned disadvantages and be convenient and efficient in operation. Another object of the invention is to provide such a machine having sensitive controlling means for reversing the direction of travel of a lens across the face of a grinding wheel. Still another object of the invention is to provide a machine having a lens that travels substantially all the way across the face of a grinding wheel to effectively eliminate unused grinding areas on the grinding face. A further object of the invention is to provide a machine in which one side of the lens activates the mechanism for reversing the direction of movement of the lens across the grinding face thereby eliminating the need for individual adjustments of the wheel or lens carriage.

Other objects and advantages pertaining to the construction of the device and to the form and relation of parts thereof will more readily appear from the following description taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a lens edging machine embodying our invention.

Fig. 2 is a schematic view showing the means for controlling movement of the lens carriage.

Fig. 3 is an enlarged sectional view taken along the line 3—3 in Fig. 1, showing a detail of the hydraulic pump.

Fig. 4 is an enlarged sectional view taken along the line 4—4 in Fig. 1, showing a detail of the reversing arrangement.

Fig. 5 is a view partially in section along the line 5—5 in Fig. 2, showing a lens just contacting one of the reversing fingers.

A main stationary frame (not shown) carries a rotatable grinding wheel 10 which has a cylindrical grinding face 11 having boundaries 12 and 13 on opposite sides there-

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of. A power means (not shown) drives both the grinding wheel 10 and the shaft 15. On the shaft 15 is a pulley 16 which drives a belt 17 that extends to and drives a pulley 18 keyed on a sleeve 19 rotatably supported in an arm 20 which is secured to a base plate 21 fastened on the main frame transversely to and in proximity to said grinding wheel 10. The sleeve 19 is clutched on the shaft 22 by a clutch mechanism 23 operated by a lever (not shown) which is used to separate clutch drive plate 24 and clutch disk 25. The shaft 22 is journaled at one end in bushing 26 of arm 27 and has a spline at 28 near its other end for slidably fitting into a mating portion in clutch disk 25.

A carriage 29 is mounted on the base plate 21 so as to be slidable in a plane parallel to the axis of the grinding wheel 10 on the shaft 22 which extends through said carriage. The carriage 29 has at each end upwardly extending portions 30 which carry bearings 31 in which the shaft 22 is rotatably mounted. Blocks 32 and 33 are secured on the shaft 22 against the opposite ends of the carriage so that when the carriage is moved longitudinally the rotating shaft 22 will be moved longitudinally also and will continue to be rotated by the pulley 18 through the clutch 23 and spline 28.

A frame 34 is pivotally mounted upon the carriage 29 about the shaft 22 so as to rock transversely of the carriage and move longitudinally with the carriage, but has no longitudinal motion independent of the carriage. The frame 34 has two upstanding portions 35 and 36 for rotatably supporting, respectively, the two aligned shafts 37 and 38. Secured to shaft 37 is a gear 39 that is driven by a pinion 41 on the shaft 22. Likewise, shaft 38 has a gear 40 driven by a pinion 42 on the shaft 22. It is obvious from this construction that when the shaft 22 is rotated the pinions 41, 42 will drive gears 39, 40 to rotate the shafts 37 and 38 simultaneously.

The shaft 38 is rotatably mounted in portion 35 with a bearing 43 on each side of the gear 40. Removably fastened at the outer end of the shaft 38 is a pattern cam 44 which is shaped to conform to the desired shape and size of a lens 45 to be edged. A fixed block 46 is secured to the arm 27 against which the cam pattern 44 rides to permit the lens 45 to be shaped the same as the cam pattern 44. Attached at one end to a pin 35' on the upstanding portion 35 of the frame 34 is a spring 44' which is adapted to rock said frame 34 toward the main stationary frame on which the other end of the spring 44' is attached to a pin 37'. This rocking of the frame 34 will bring the edge of the lens 45 against grinding wheel 10 so that the lens is ground to the shape of pattern 44. When the lens has been edged to the point where the cam 44 contacts the block 46 continually through a complete revolution of the cam, the lens is then of the proper peripheral size and further grinding does not take place.

The lens 45 is held between the rubber pads 48 and 50 which are carried by the enlarged ends 47 and 49 formed, respectively, on the ends of shafts 38 and 37. The shaft 37 is free to move lengthwise in sleeves 51 and 52 and is urged by spring 53 in the direction that will hold the lens 45 between the pads 48 and 50. A lever 54 is pivoted on upstanding portion 35 to engage with collar 55 on shaft 37, so that by pivoting the lever against the force of the spring, a lens can be removed from or inserted between the pads 48 and 50.

The means for driving and reversing the lens carriage 29 transversely of the grinding face 11 is shown in Figs. 1, 3 and 4. Attached to base plate 21 is a piston cylinder 58 having fluid ports 59 and 60 communicating with ports 61 and 62 in the base plate 21 and having a piston 63 attached to piston rod 57. The piston rod 57 extends axially both ways beyond the cylinder 58 into con-

tact with the abutments 56 depending downwardly from the carriage 29. Fitted into opening 64 in base plate 21 is a pump housing 65, for receiving a rotary valve 66, as is best shown in Fig. 3, having an eccentric bore 67 in which is mounted a rotary impeller 68 coaxial with the axis of the valve but eccentric with respect to the bore 67. The impeller 68 has blades 69 spring-biased outwardly toward the walls of the bore 67 by springs 70. The valve 66 rotates freely in bore 67 and is provided with ports 71, 71' on opposite sides of the housing 65 to communicate with the ports 61 and 62 in the base plate and 59 and 60 in the cylinder. The impeller 68 is attached to shaft 72 which is fastened to worm wheel 73 which meshes with worm gear 74 on rotating shaft 15. Rotation of the shaft 15 drives the impeller 68 to pump fluid from one side of piston 63 through the ports and into the other side of the piston to drive the piston in the direction of flow of fluid.

Referring to Figs. 1, 2, 3 and 4, a pawl 76 comprising ends 77, 78 and attached lever 79, is mounted in cap 65' in the lower portion of base plate 21 to pivot about the axis of a shaft 80 lying in the same plane as and at right angles to the axis of the impeller shaft 72. As the shaft 80 is rocked about its axis, the opposite ends 77 and 78 of the pawl 76 are alternately forced into the path of a lever 81, as shown in Fig. 4, which is eccentrically pivoted at 82 to the face of the rotary valve 66 so as to rotate with said valve. The lever 81 is provided with a gripping portion 83 for frictional engagement with the inner cylindrical walls of the cap 65' when the lever 81 encounters either end 77, 78 of the stop pawl 76. Lever 81 is spring-pressed in the direction of rotation of the valve 66 by spring 84 which releases the gripping portion 83 from the cap 65' when ends 77, 78 of pawl 76 are pivoted out of contact with the lever.

The friction produced by the impeller 68 and blades 69 within the valve 66, along with the flow of fluid through the valve 66 tends to rotate the valve 66 and attached lever 81. This rotation of the valve 66 is interrupted by the lever 81 on the valve engaging with either end 77, 78 of pawl 76. By rocking the ends 77, 78 of pawl 76 out of contact with the lever 81, the valve 66 and attached lever 81 will rotate 180° until the lever 81 contacts the other end of pawl 76. This rotation of the valve 66 will reverse the ports 71, 71' in the system and the pumping action of impeller 68 will pump the fluid in the opposite direction from its previous flow, thereby reversing the direction of movement of the piston 63 and its attached rod 57 so that the movement of lens carriage 29 is reversed.

The mechanism which has been described is well known in the prior art. In such prior devices, the direction of movement of the lens carriage is reversed by the engagement of the lever 79 with a pair of oppositely positioned stops which are adjustable in accordance with the thickness of the lens to be edged so that the entire surface of the grinding wheel will be contacted by the edge of the lens so the grinding surface is worn down uniformly. The operators, however, usually neglect to make such adjustments with the result that the grinding surface soon has ledges formed adjacent its edges. With our new device, the travel of the lens carriage is automatically controlled by the thickness of the lens so that individual adjustments need not be made for each lens.

In our controlling mechanism, the lever 79 engages collar 85 carried by the core 86 of the solenoids 87 and 88 which are held by brackets 67' to the plate 21 by bolts 75 extending through the brackets 67', cap 65' and valve housing 66. As the solenoids are alternately energized the core 86 is reciprocated from one side to the other so that the lever 79 and pawl 76 are moved. The energizing of alternate solenoids is produced by a mechanism which will now be described.

Slidably supported in uprights 91, 92 is a shaft 93 having a longitudinal slot 94 adapted to receive a lug

95 downwardly urged by spring 96 which is held by a cap 97 on upright 92. The spring pressed lug 95 coacts with the slot 94 to prevent shaft 93 from rotating about its axis and to resist, but not prevent, axial sliding of the shaft. Two fingers 98, 99 having bearing tips 100, 101 are fastened to shaft 93 by adjusting screws 102, 103 so that the tips 100, 101 will be adjusted to lie in close proximity to the outer boundaries 12, 13 of the grinding wheel 11 on opposite sides of said lens 45. Stop 104 retains lug 95 in the slot 94 and the end of shaft 93 carries a screw 106 whereby adjustments may be made between the end of the shaft 93 and a sliding pin 108 in switch 107, as well hereinafter be described.

A two pole switch 107 has a slidable pin 108 in alignment with shaft 93 and the contact therebetween is adjusted by screw 106 so that the screw 106 is always in end to end contact with pin 108 which contacts right angled resilient strip 109 connected at one end 110 to one side 111 of power supply switch 112 through an insulated pole plug 113. When the lens 45 moves to its extreme left hand position in Fig. 2, the shaft 93 and screw 106 are moved to their extreme left positions which permits the resilient strip 109 to move pin 108, still in contact with screw 106, until the contact 114 of said strip 109 engages point 115 to make a complete connection from the power supply switch 112, pole plug 113, strip 109, contact 114 to point 115, pole plug 117, solenoid 87 and contact 116. In like manner, when lens 45 moves the shaft 93, screw 106 and pin 108 to the extreme right hand position, the pin 108 biases strip 109 upwards so that contact 114 engages point 118 to make a complete connection from supply switch 112, pole plug 113, strip 109, contact 114 to point 118, pole plug 120, solenoid 88 and contact 119.

Reciprocating about the axis of the rock shaft 80 between the contact members 116 and 119 is a snap arm 122 of snap actuator 123 which has an upper arm 124 rigidly attached to the rock shaft 80 extending through a bearing portion in the cap 65' into rigid attachment with the pawl 76 of the controlling mechanism. The pawl 76, shaft 80 and upper arm 124 are mounted to pivot together about the axis of the shaft 80 so that the upper arm 124 of the snap actuator 123 will be reciprocated between the stops 125 as the lever 79 of pawl 76 is reciprocated by the solenoids 87 and 88. Pivoting in the same plane as, but independent of the movement of the upper arm 124 of the snap actuator 123, is the snap arm 122 which is electrically connected with the side 121 of the power supply switch 112. A spring 126 is attached between upper arm 124 and snap arm 122 so that when pawl 76 and shaft 80 move the upper arm 124 to a position on the opposite side of the center line of snap arm 122, the arm 122 will be moved from contact with member 116 into contact with member 119.

In operation, as the lens 45 of Fig. 2 is moved a slight distance to the left from its disclosed position on the grinding face 11 of the lens edging machine, the peripheral part of the left face of the lens will move the finger 98 and attached shaft 93 a slight distance to the left. This movement of shaft 93 will permit resilient strip 109 of the switch 107 to move the pin 108 to the left so that contact 114 will engage point 115 to complete the circuit from the electrical supply source switch 112 through plug 113, strip 109, point 115, plug 117, solenoid 87, member 116, snap arm 122 and back to the switch 112. This will energize the solenoid 87 to pull the solenoid core 86 and pawl lever 79 to the left thereby pivoting pawl 76, rock shaft 80 and upper arm 124 in a clockwise direction. This movement of pawl 76 will release its end 77 from lever 81 of valve 66 to initiate rotation of the valve by rotation of the impeller 68 within the valve 66. This initial rotation of the valve will move the valve ports 71, 71' out of alignment with the piston ports 61, 62, respectively, to stop further movement of the lens to the left. When upper arm 124 has been pivoted beyond the center line of snap arm 122, the spring 126 will pull

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arm 122 out of engagement with member 116 to break the circuit through switch 107 and solenoid 87. The force of spring 126 will not only move snap arm 122 into engagement with member 119, but also will act through rock shaft 80 to pawl 76 to thereby position pawl end 78 in the path of lever 81 of valve 66. Pawl end 78 will stop the rotation of valve 66 when ports 71, 71' are aligned, respectively, with ports 62, 61 in such a position that fluid may be pumped from the right to the left side of the piston 63 to drive the carriage 29 with lens 45 to the right across the face of the grinding wheel. When lens 45 contacts finger 99 and moves shaft 93 to the right, the corresponding circuits are energized to again reverse the direction of travel of the lens 45.

From the foregoing, it is obvious that we are able to attain the objects of our invention and provide improved means for increasing the effective working area of a lens edging wheel. The new controlling means for the reversing mechanism will substantially reduce the time consuming adjustments required by prior edging machines. The new controlling means is automatically adjusted for lenses of any thickness, the outer peripheral face of each lens acting to control the reversing mechanism. Various modifications may obviously be made without departing from the spirit of our invention as pointed out in the appended claims.

We claim:

1. In a lens edging machine having a continuously rotating grinding wheel with a grinding face thereon, means for holding the edge of a lens in contact with the grinding face of said wheel, means for moving the edge of the lens across said grinding face, and reversing means for changing the direction of movement of the lens across said grinding face, the combination of means controlling the reversing means comprising at least two spaced fingers disposed on opposite sides of the lens and respectively adjacent the boundaries of the grinding face in the path of movement of the lens, and means operably connecting said fingers to said reversing means whereby contact of the lens with either finger will change the direction of travel of the lens across the grinding face.

2. A lens edging machine comprising a continuously rotating grinding wheel having a grinding face thereon, means for holding the edge of a lens in contact with the grinding face of said wheel, means for moving the edge of the lens across said grinding face, reversing means for changing the direction of movement of the lens across said grinding face, means for controlling said reversing means comprising at least two spaced fingers disposed respectively adjacent the boundaries of the grinding face in the path of movement of the lens, and means operably connecting said fingers to said reversing means whereby contact of the lens with either finger will change the direction of travel of the lens across the grinding face.

3. In a lens edging machine having a continuously rotating grinding wheel with a grinding face thereon, means for holding a rotating lens with its edge in contact with the grinding face of said wheel, means for moving the edge of the lens across said grinding face, and reversing means for changing the direction of movement of said lens across the grinding face, the combination of means for controlling the reversing means comprising a pair of spaced movable fingers, means operably connecting said fingers to said reversing means, said fingers being disposed on opposite sides of the lens and respectively adjacent the boundaries of the grinding face and in the path of said lens whereby said lens will move said fingers for controlling the reversing means to change the direction of movement of the lens across the grinding face.

4. In a lens edging machine having a rotating grinding wheel with a grinding face thereon, means for holding a rotating lens with its edge in contact with said grinding face, and means for moving the edge of said lens across said grinding face, the combination of a pair of spaced, movable contact means lying respectively adjacent the bound-

aries of the grinding face on opposite sides of the lens, reciprocable means supporting said contact means in the path of said lens, switch means constructed and arranged to be engaged by said reciprocable means, and reversing means energized by the switch means for changing the direction of movement of said lens whereby as the lens approaches either boundary of the grinding face it moves one of said contact means so that the reciprocable means is moved into engagement with said switch means to energize the reversing means thereby changing the direction of movement of said lens across said grinding face.

5. In a lens edging machine having a continuously rotating grinding wheel with a grinding face thereon, means for holding a rotating lens with its edge in contact with the grinding face of said wheel, means for moving the edge of said lens across said grinding face, and reversing means for changing the direction of travel of said lens, the combination of means for controlling said reversing means comprising a pair of spaced fingers disposed respectively adjacent the boundaries of the grinding face on opposite sides of said lens, a slidable shaft supporting said fingers in the path of said lens whereby said shaft and fingers are reciprocated by said lens, and means operably connected to said shaft for controlling the reversing means whereby the movement of said shaft and fingers in either direction controls the reversing means for changing the direction of movement of the lens.

6. A lens edging machine comprising a continuously rotating grinding wheel having a grinding face thereon, means for holding a rotating lens with its edge in contact with the grinding face of said wheel, means for moving the edge of said lens across said grinding face, reversing means for changing the direction of travel of said lens, a pair of spaced, movable fingers disposed respectively adjacent the boundaries of the grinding face and on opposite sides of the lens, a slidable shaft for supporting said fingers in the path of said lens, a switch means adapted to be contacted by said shaft for energizing said reversing means, resilient means engaging with said shaft for resisting axial movement of the shaft by said lens whereby movement of the lens against the fingers will move the shaft against the resistance of the resilient means to activate the reversing means for changing the direction of movement of the lens.

7. A lens edging machine comprising a continuously rotating grinding wheel with a grinding face thereon, holding means for positioning the edge of a lens in contact with said grinding face, moving means for traversing the edge of the lens across said grinding face, reversing means for changing the direction of travel of said lens across said grinding face, means for controlling said reversing means comprising a pair of spaced, movable fingers disposed respectively adjacent the boundaries of the grinding face on opposite sides of said lens, and supporting means for holding said fingers in the path of said lens operably connected to said reversing means whereby movement of the fingers and supporting means in either direction by the moving lens activates the reversing means for changing the direction of travel of the lens across the grinding face of the wheel.

8. In a lens edging machine having a continuously rotating grinding wheel with a grinding face thereon, means for holding the edge of a lens in contact with the grinding face of said wheel, means for moving the edge of the lens across said grinding face, and reversing means for changing the direction of movement of said lens, the combination of means for controlling said reversing means comprising two spaced, movable fingers disposed respectively adjacent the boundaries of said grinding face on opposite sides of said lens, a reciprocable shaft supporting said fingers in the path of said lens, a switch having two poles that are alternately activated by the movement of said shaft, two solenoids electrically connected with said switch so that when said shaft activates one pole of the switch one of the solenoids will be energized, and means actuated by

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the movement of the core of the energized solenoids for
controlling the reversing means for reversing the travel
of the lens across the grinding face.

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