

Nov. 7, 1950

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2,528,952

PRESSURE DEVICE FOR LENS GRINDING MACHINES

Filed April 6, 1946

3 Sheets-Sheet 1

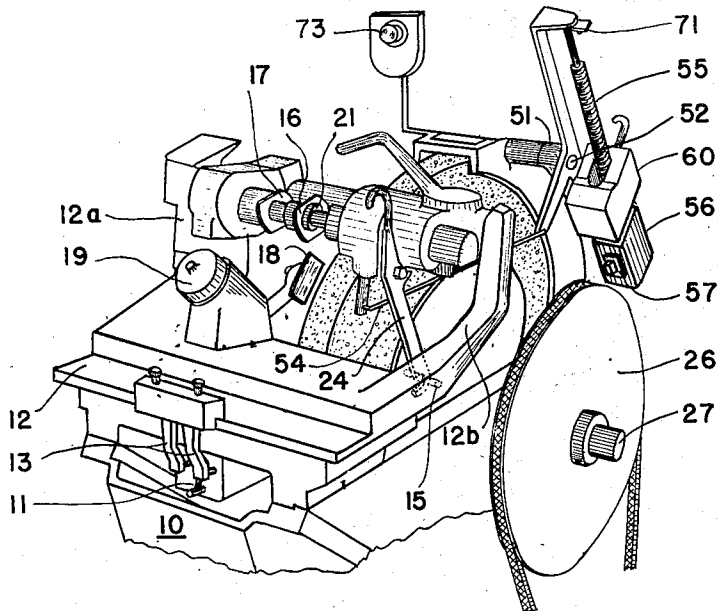


Fig. 1

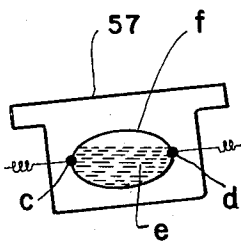


Fig. 7

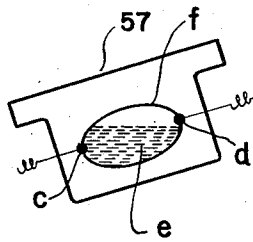


Fig. 8

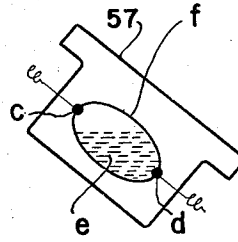


Fig. 6

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3 Sheets-Sheet 2

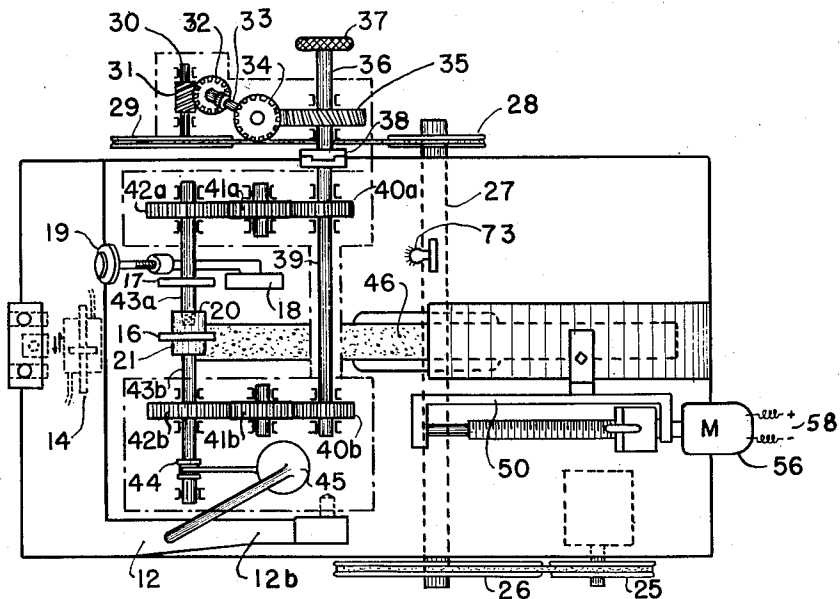


Fig. 3

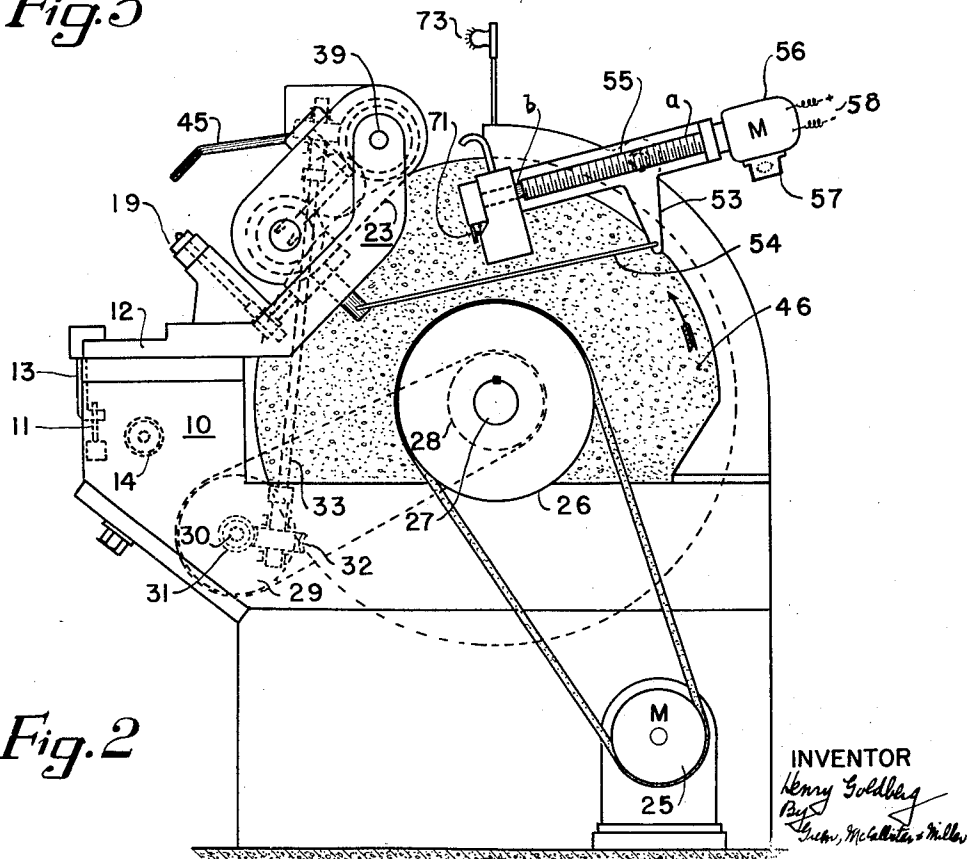


Fig. 2

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PRESSURE DEVICE FOR LENS GRINDING MACHINES

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3 Sheets-Sheet 3

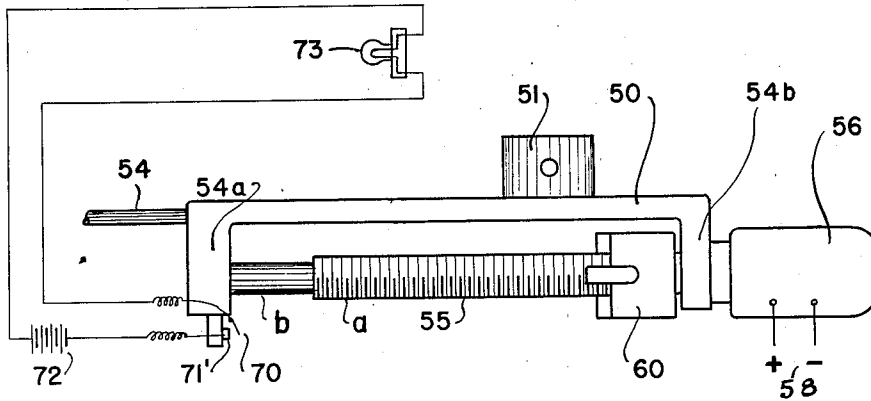


Fig. 5

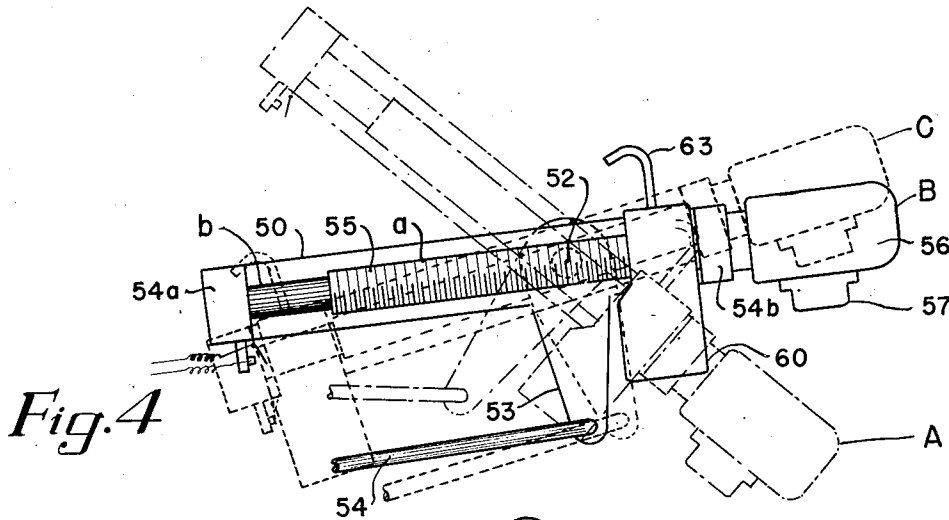


Fig. 4

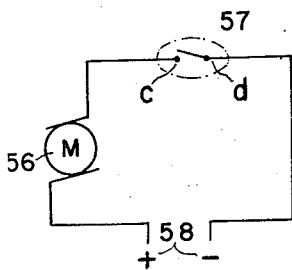


Fig. 9

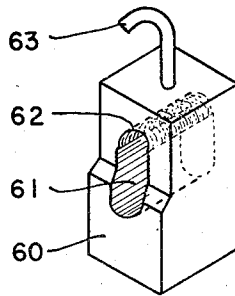


Fig. 10

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UNITED STATES PATENT OFFICE

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PRESSURE DEVICE FOR LENS GRINDING MACHINES

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Application April 6, 1946, Serial No. 660,234

19 Claims. (Cl. 51—101)

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This invention pertains to a device for controlling and increasing the pressure application between a tool and a piece to be edge conditioned, and particularly, to an automatic pressure attachment for rimless edge grinding machines.

Previous to the present invention, difficulty has been encountered in providing a satisfactory edge grinding pressure attachment due to the sensitive, smooth, and continuously increasing nature of the operation required. Commercial pressure attachments on rimless machines at the present time are hand operated and the amount of pressure has to be left to the operator's judgment and is more or less guess work. Some lenses receive more pressure than needed and chip and crack; others do not receive enough pressure and consume more time than needed. The operator has to move constantly from one machine to another to shift the pressure weight on each machine which is moved by hand along the guide rod to increase the pressure a little at a time, making it necessary for the operator to walk up and down a battery of machines at least four times before a particular lens is finished in one machine. For example, the man in charge of a battery of ten machines utilizing twenty-five feet of floor space in starting at the first machine, can load ten in approximately fifteen minutes. He then returns to the first, looks after the lens, increases the pressure and continues until he reaches the tenth machine, which takes approximately five minutes. Repeating this operation each time, fifteen minutes are spent in loading and ten to fifteen minutes are spent in increasing the pressure, making a total of thirty-five minutes before the operator can remove the finished lens from the first machine. Additional time will be required to progressively move the lenses from the other machines.

Although automatic pressure devices have been devised, they have not been commercially practical for a number of reasons and, as a result, the art has continued to use manually operated pressure controls.

And, it has been an object of my invention to devise an automatic pressure attachment that will be commercially practical and foolproof in utilization.

Another object has been to provide a device which will smoothly and uniformly increase the pressure upon a lens being ground with a minimum of spoilage. In accordance with requirements of the art, spoilage should be not greater than that due to manual control.

A further object has been to provide a new and

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improved automatic pressure device for surface conditioning machines.

A still further object has been to increase the efficiency of operation of a lens grinding machine and to minimize spoilage.

These and many other objects of my invention will appear from the embodiment chosen for the purpose of illustration.

In the drawings:

10 Figure 1 is a front perspective view in elevation of a rimless edge grinding machine employing my invention.

Figure 2 is a side view in elevation of the machine of Fig. 1.

15 Figure 3 is a top plan view of the machine of Fig. 1 with housing parts removed to show driving connections.

Figure 4 is a side view in elevation of a device constructed in accordance with my invention, the dot and dash lines of A show it in an inoperative position; the full lines of B show it at a starting position; and the dotted lines of C show it at the end of an operative movement.

Figure 5 is a top plan view of the device of 25 Figure 4, showing a pressure control member at position B and a circuit for indicating position C of Fig. 4.

Figs. 6, 7 and 8 are enlarged side sectional views in elevation of a position-sensitive switch for 30 opening and closing circuit connections to an actuating motor for the device of Fig. 4. Fig. 6 corresponds to dot and dash line position "A." Fig. 7 corresponds to full line position "B," and Fig. 8 corresponds to dot and dot line position 35 "C" of Fig. 4.

Fig. 9 is a somewhat diagrammatic circuit arrangement showing a connected relationship for a position-sensitive switch and an actuating motor of Fig. 4.

40 Fig. 10 is an enlarged perspective detail view in elevation of a pressure control member or element shown in a mounted relationship in Fig. 4.

Edge grinding machines such as employed in the optical art are generally belt driven and provided with either a transversely reciprocating lens carrying head for moving the lens back and forth across a grinding wheel surface, or with a grinding wheel which moves transversely across the surface of the lens.

50 In Fig. 1, I have shown a machine having a frame 10 in which a lens carrying frame 12 reciprocates transversely with respect to the grinding wheel, as effected by fluid motor 14, and as limited by a stop element 11 on frame 10 and adjustable fingers 13 on frame 12. In such a

machine, it is customary to provide a pattern piece former, or template 17 that corresponds to the desired shape or contour of a finished lens and is adapted to abut against a contact plate 18 to pattern the grinding action on the lens 16. A micrometer adjustment 19 is shown in Figure 1 for adjusting relationship of the guide plate to the template 17. It is also customary in the art to provide transversely adjustable chuck means 20 and 21 for positioning the template 17 and a lens 16 to be ground and gear means for rotating the template and lens while held by such chuck means. The chuck means 20—21 is mounted in a pivoted head portion of the machine in order that the lens can be moved to and from or into and out of an operative position with respect to the grinding wheel.

The device of my present invention may be adapted to any conventional type of edge grinding machine and is connected by lever means to the pivoted lens piece carrying head or operating member in such a manner that an application of grinding pressure may be effected by moving the lens towards the grinding wheel with an increasing force as the edge-conditioning operation progresses.

Referring particularly to Figures 1, 4 and 5, I have shown an automatic pressure translating or applying device which comprises a carrier arm, member, or bracket 50 having a support 51 constructed and arranged to be pivoted at 52 to an extension of the frame 10. The carrier member 50 is provided with a pair of longitudinally spaced apart, laterally extending portions 54a and 54b at opposite ends thereof which rotatably journal a shaft 55. The shaft 55 at one end extends through the portion 54b and is shown connected to an electric motor 56. It will be apparent that the shaft or weight supporting rack member 58 which is provided with indentations for adjustably moving or advancing the weight therealong may be an extension of the shaft of the motor 56. A major portion of the shaft 55 that is located between the projections 54a and 54b is provided with threads *a* as shown, to receive an adjusting member or weight portion 60, see particularly Figure 10. The weight portion is shown provided with a slot or hole 61 extending therethrough which is oval or oblong in shape. It will be noted that its upper surfaces 62 are threaded to engage the threaded portion *a* of the shaft 55. A handle or hook 63 extends from a top face of the member 60; in this manner, the surfaces 62 of the member 60 can be raised to clear the threaded portion *a* of the shaft 55 and to permit the weight member to be moved to any position along such shaft. This is advantageous in moving the weight back to its original starting position after the completion of an edge grinding operation or for starting the weight at any desired position along *a*.

At its extending end, the shaft 55 is provided with a non-threaded portion *b* of slightly less diameter than the threaded portion *a*. Its length or extent corresponds to a length dimension of the weight member 60 taken along the axis of the slot or hole 61 therethrough. As shown in Figures 2 and 4, at the completion of a grinding or edging operation, the weight 60 slides off the threads *a* onto the non-threaded portion *b*, and in so doing, may move a spring-like switch element 70 into contact with a switch pole 71, see Figures 2 and 5, which closes an electric circuit through a source of power 72 to light an indicator

such as a light 73 and warn the operator that the operation has been completed.

A suitable circuit, actuating connection, or energizing system for actuating motor 56 is shown in Figure 9 and includes a source of power 58 that is connected through terminals *c* and *d* of a mercury switch 57. As shown particularly in Figures 6, 7 and 8, the switch 57 has a suitable electric-current conducting fluid such as mercury *e* enclosed within a non-conducting cup or container portion *f* thereof that will automatically turn the switch on and off by connecting and disconnecting points *c* and *d*, depending upon the position of the pivot support 51 and thus, of the motor 56, which is mounted on the projection 54b of the carrier 50. It will thus appear that the actuating connection of the motor or motive means 56 is disconnected when the movement translating connections of the device to the operating member or head of the machine have reached selected or predetermined positions. The switch 57 located between the motor 56 and the actuating connections thus serves as a shut-off or connecting and disconnecting means therebetween.

A connector or lever arm 53 extends downwardly as a part of the carrier 50 and is connected by a rod 54 to an extension of the pivoted head 23 of the grinding machine. The weight of the parts of the carrier member 50 are so located with respect to the pivot point 52 that they are in substantial balance at the beginning of the edge grinding operation, as shown by full line position "B" of Figure 4. Thus, when the device is moved to an inoperative position "A," as indicated by dot and dash lines in Figure 4, it will stay there until raised to the full line position "B." The dot and dot line of position "C" shows the device at the end of its pressure stroke or when a maximum pressure application is being effected.

Referring to Figures 6, 7 and 8, it will be apparent that when the device is moved to the position "B," current will flow between points *c* and *d* through the liquid conductor *e*, see Figure 7, to actuate motor 56 and rotate the extending support member or shaft 55 and its threaded portion *a* to progressively advance the weight portion or member 60 towards the left of the figures. The extending support member or shaft 55 serves as a rack or support which may, as shown, mesh with the weight portion or member 60 to advance the latter progressively therealong. This movement gradually raises the right hand portion of the carrier 50 and thus gradually applies the full weight of the member 60 to move lens 16 with increasing pressure against or towards the grinding wheel. That is, as the weight 60 moves to the left of the figures, or in other words, towards the portion *b* of the shaft 55, the center of gravity of the arm 50 shifts to the left and gradually increases the effective pressure with which the lens is urged against the grinding wheel. At the finish of an edge grinding operation, the operator lifts the weight member 60 back to its starting position on *a*.

Although the edge grinding machine, itself, is not a part of my invention, I will briefly describe a typical machine as shown particularly in Figures 1, 2 and 3. A suitable motive agency 25 drives belt wheel 26 that is feathered on shaft 27; and, the latter drives grinding wheel 46 and belt wheel 28 that is feathered on its opposite end. Belt wheel 28 drives wheel 29 and shaft 30 to actuate worm 31 which meshes with worm

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gear 32. Gear 32 actuates vertical shaft 33 and helical gear 34. The helical gear 34 meshes with helical gear 35 feathered on clutch shaft 36 that actuates lens supporting shafts 43a and 43b in unison through clutch halves 38, shaft 39, spur gears 40a, 40b, 41a, 41b, 42a, and 42b that are mounted on the pivoted or movable head 23. The shaft 43b and its associated chuck 21 may be moved into and out of position by means 44 and 45.

The lens carrying head 23 is pivotally mounted on shaft 39, by a pair of arms 12a and 12b extending upwardly from the reciprocating carrying frame 12, see Figure 1. The movable head 23 may be locked in an "up" position by engaging lower latch end of pivoted arm 24 with pin 15 on the extension support arm 12b of frame 12. The driving connections for the lens 16 can be disconnected by pulling hand wheel 37 outwardly to disconnect clutch halves 38, see Figure 3.

The threads *a* on the shaft 55 of the pressure attachment 50 may have a pitch of so many threads per inch for timing the movement of the weight to, for example, increase the pressure application to a maximum in exactly ten minutes. The motor 56 is preferably a slow speed type or is provided with a gear reducing connection for this purpose. The actuation of the pressure adjustment device 50 is independent of the driving parts of the lens grinding or surface conditioning machine.

Figure 8 shows the position of the mercury switch 57 after the weight member 60 has moved off the threads *a* and onto the non-threaded portion *b* of the shaft rack, or extending support member 55. That is, this switch can also be utilized to automatically turn off or disconnect the motor 56 at the end of a certain period of time or at the end of the movement of the weight 60. For example, if the operator wishes to let the motor 56 run when the weight 60 is at position C, a small additional amount of conductor fluid *e* may be added to the container *f* in order that switch contact *d* will be closed instead of open as shown in Figure 8. That is, mercury may be added or removed to effect the desired operative timing.

By utilizing my invention, the efficiency of a lens grinding battery of machines can be increased and a smooth, continuously increasing pressure application can be obtained. Spoilage has been decreased to a remarkable extent, substantially to a vanishing point. There is no guess work or sudden increase of pressure. For example, the weight 60 can move down the threaded rod at a rate of approximately one inch per minute assuring a very slow and uniform pressure increase. It will also be noted that the driving connections for the screw shaft 55 are independent of those pertaining to the edging machine, itself; this is an important feature of my present invention taken in connection with the fact that the motor 56 is carried by the pivoted weight-carrying bracket or arm member 50. That is, my device may be mounted on any suitable machine, can be used manually if the motor 56 or its power supply fails, and spoilage or chipping of the lens is nil. The uneven, jarring action incident to the operation of a pressure apparatus geared to a grinding machine has been eliminated. The weight 60, due to the extent of its threads 62, gradually and smoothly moves off the threaded portion *a* of shaft 55 upon portion *b*; the diameter of portion *b* preferably substantially corresponds to the diameter of portion *a*.

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between depressed portions or valleys of its threads. As will be appreciated, the pitch of the threads *a* and 62 will, with the speed of motor 60, govern the timing of the operation; as previously indicated, I prefer to utilize a relatively slow speed motor. For example, the timing may be such that the weight or balance member 60 moves from its starting position "B" to its final position "C" in approximately 8 minutes. I have been able to speed up a battery of machines by employing the present invention and over a testing period of approximately seven weeks have not had one chipped or spoiled lens.

It will be apparent to those skilled in the art that various changes, alterations and additions to the device of my invention may be made without departing from the spirit and scope thereof as indicated by the appended claims.

What I claim is:

1. A pressure increasing device adapted to be operably connected to an operating member for moving a piece relative to a tool in an edging machine, comprising a carrier member, a pivot support for said carrier member, means on said carrier member constructed and arranged to operably connect it to the operating member of the machine, a shaft operably carried by said carrier member, means on said carrier member for actuating said shaft, a weight member operably positioned on said shaft and constructed and arranged to move therealong when said shaft is actuated, and control means on said carrier member for connecting and disconnecting said actuating means, said control means having portions sensitive to the pivoted position of said carrier member.

2. A pressure increasing device adapted to be operably connected to an operating member for moving a piece relative to a tool in an edging machine, a carrier member having a pair of laterally extending portions at opposite longitudinal ends thereof, a pivot support for said carrier member, means for connecting said carrier member to the operating member of the machine, a shaft rotatably positioned in one of said extending portions and rotatably mounted in and extending through the other of said extending portions, a weight member adjustably carried by said shaft, a motor mounted on said carrier member adjacent said last-mentioned extending portion thereof, said motor being operably connected to said shaft for rotating it, a power supply for said motor, a mercury switch sensitive to the pivoted position of said carrier member and connecting said motor to said power supply.

3. A pressure increasing device adapted to be operably connected to an operating member for moving a piece relative to a tool in an edging machine, comprising a carrier member having transversely extending portions at opposite ends thereof, a pivot support for said carrier member, means for operably connecting said carrier member to the operating member of the machine, a shaft rotatably positioned in said projecting portions and extending through one of them, a motor operably connected to the extending end of said shaft, a weight member operably positioned on said shaft and constructed and arranged to move along said shaft to change the pivoted position of said carrier member when said shaft is rotated, an indicator circuit, a switch in said indicator circuit constructed and arranged to be closed when said weight member has reached one end of said carrier member.

4. A pressure increasing device adapted to be

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operably connected to an operating member for moving a piece relative to a tool in an edging machine, comprising a carrier member, a pivot support for said carrier member located beyond its normal center of gravity, means for operably connecting said carrier member to the operating member of the machine, a shaft rotatably mounted on said carrier, actuating means on said carrier connected to said shaft, said shaft having one portion threaded therealong and terminating in an unthreaded portion, a weight member having a slot therein to receive said shaft, said weight member having threads along at least a portion of said slot constructed and arranged to engage the threaded portion of said shaft, said unthreaded portion of said shaft being of a length sufficient to clear said weight member from the threaded portion thereof, a light indicator circuit having a switch therein, said switch being positioned on said carrier adjacent the unthreaded portion of said shaft and being constructed and arranged to be closed when said weight member has moved thereon.

5. A pressure increasing device adapted to be operably connected to an operating member for moving a piece relative to a tool in an edge grinding machine, comprising a carrier member, a pivot mount for said carrier member, means constructed and arranged to operably connect said carrier member to the operating member of the machine, a motor on said carrier member having an energizing system, a weight portion on said carrier and constructed and arranged to be moved therealong by said motor, and control means operably connected to said energizing system and sensitive to the pivoted position of said carrier member for automatically disconnecting said motor from its energizing system.

6. A pressure-applying device for a lens grinding machine that has an operating member for moving a work piece relative to a grinding surface, said pressure device being constructed and arranged to be pivotally mounted on the machine, movement translating connections carried by said device for operably connecting said device to the operating member, a rack member carried by said device, a weight member operably mounted on said rack member for advancing movement therealong, a motor operably associated with said rack member and said weight member for advancing said weight member along said rack member to change the pivoted position of said device, an actuating connection to said motor, a shut-off in said actuating connection, and a position-sensitive means carried by said shut-off to disconnect said motor from said actuating connection when said device is in a predetermined pivoted position.

7. A pressure applying device as defined in claim 6, wherein said motor is an electric motor carried by said pivotally mounted pressure device, said actuating connection is an electric circuit, and said shut-off is an electric switch sensitive to the position of said electric motor.

8. A pressure applying device as defined in claim 6, wherein said shut-off is constructed and arranged to disconnect said motor when said pressure device is at its opposite extreme pivoted positions.

9. A pressure applying device for a grinding machine having an operating member for moving a work piece relative to a grinding surface comprising an arm member provided with a pivot connection offsetly positioned therealong for mounting said device on the machine, a lever

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arm extending from said arm member and being provided with a movement translating connection for operably connecting said device to the operating member, a motor on the end of said arm member that is nearest to said pivot connection, a shaft, said shaft at one end thereof extending into said motor and being mounted adjacent its other end on said arm member, a weight portion associated with said motor and constructed and arranged to be moved along said shaft by said motor, an actuating connection to said motor, a switch in said actuating connection, said switch having a contact constructed and arranged to disconnect said motor from said actuating connection when said weight portion has been moved by said motor to the end of said shaft which is mounted on said arm member.

10. A pressure increasing device adapted to be operably connected to an operating member for moving a piece relative to a tool in an edging machine comprising, an arm member, a pivot support for said arm member located intermediate the end portions of its length and closer to one end portion than the other end portion thereof, means for connecting said arm member to the operating member of the machine, a shaft extending along said arm member and being rotatably positioned thereon, motive means on said arm member adjacent the end portion thereof that is nearest to said pivot support, said motive means being operably connected to said shaft, an actuating connection to said motive means, a weight portion operably positioned on said shaft and constructed and arranged to move therealong from said last-mentioned end portion thereof towards the other end portion thereof when said shaft is operated by said motive means, and means on said arm member constructed and arranged to disconnect said motive means from said actuating connection when said weight portion has moved to a predetermined position along said shaft.

11. A pressure increasing device as defined in claim 10, wherein said shaft is provided with teeth along its length, said weight portion has a slot therethrough and an upper wall of said slot has teeth thereon constructed and arranged to operatively engage the teeth on said shaft and to move said weight portion therealong when said shaft is operated by said motive means and said slot is of sufficient length such that its teeth may be raised out of engagement with the teeth of said shaft for moving said weight portion back to a starting position.

12. A pressure applying device for a grinding machine having an operating member for moving a work piece and a grinding surface in a relative relationship towards each other, said pressure device being constructed and arranged to be pivotally mounted on the machine, movement translating connections for operably connecting said device to the operating member, an actuating motor carried by said device, an actuating connection to said motor, said motor being constructed and arranged to progressively move said pressure device to a selected pivoted position, and means operably associated with said motor and having a portion sensitive to the pivoted position of said pressure device that is constructed and arranged to disconnect said motor from said actuating connection when said pressure device has reached the selected pivoted position.

13. A pressure applying device for a grinding machine having an operating member for mov-

ing a work piece and a grinding surface in a relative relationship towards each other, said pressure device being constructed and arranged to be pivotally mounted on the machine, movement translating connections for operably connecting said device to the operating member, a motor carried by said device, an actuating connection to said motor, said motor being constructed and arranged to progressively move said pressure device to a selected pivoted position, and means operably associated with said motor having a portion sensitive to the pivoted position of said pressure device that is constructed and arranged to disconnect said actuating connection from said motor when said pressure device has reached the selected pivoted position, said means for disconnecting said actuating connection being carried by said motor.

14. A pressure applying device as defined in claim 13, wherein said motor is an electric motor, said actuating connection is an electric circuit, and said means for disconnecting said actuating connection is an electric switch.

15. A pressure applying device as defined in claim 14, wherein said electric switch is provided with an electric contact whose position is sensitive to the operative position of said device.

16. A pressure applying device as defined in claim 15, wherein said electric contact is an electrical conducting fluid.

17. In a pressure-applying device for a grinding machine that has an operating member for moving a work piece relative to a grinding surface, an arm member, a pivot support between opposite ends of said arm member for pivotally mounting said arm member on the machine, said pivot support being located closer to one end than the other end of said arm, movement translating connections adapted to operably connect said arm member to the operating member, a rack member carried by said arm member and extending in a spaced-apart relationship therealong, a weight member adjustably-operably positioned on said rack for movement therealong, a motor carried by said rack member and being operably associated with said rack member to move said rack member and said weight member with respect to each other to advance said weight member along said rack member from a position adjacent the above-mentioned one end of said arm member, an actuating connection to said motor constructed and arranged to energize said motor, means in said actuating connection sensitive to the relative position of said weight member along said rack member to de-energize said motor.

18. In a pressure-applying device for a grinding machine that has an operating member for moving a work piece and a grinding surface in a relative relationship towards each other with a gradually increasing pressure and then in a relative relationship away from each other, an arm member, a pivot support offsetly positioned along said arm member for mounting said device on the machine, movement translating connections for operably connecting said arm member adjacent said pivot support to the operating

member, a rack member extending along said arm member and carried thereby, a weight member constructed to be positioned in operative engagement on said rack for advancing movement in one direction therealong from a starting position to change the pivoted position of said arm member, said weight member being constructed and arranged to be lifted out of engagement with said rack member and moved in an opposite direction therealong to the starting position, a motor carried by said arm member on said rack member, said motor being operably associated with said rack member to advance said weight member from the starting position along said rack member when said weight member is in engagement therewith to progressively change the center of gravity of said arm member with respect to said pivot support, an actuating connection to said motor, means carried by said motor adapted to connect and disconnect said motor with respect to said actuating connection, said means being adapted to disconnect said motor from said actuating connection when said weight member has been moved a predetermined distance along said rack member in engagement therewith.

19. A pressure-applying device for a lens grinding machine that has an operating member for moving a work piece relative to a grinding surface, a pivot support on said pressure device intermediate and spaced from its opposite ends for pivotally mounting said device on the machine, said pivot support being located closer to one end of said pressure device than the other end thereof, movement translating connections carried by said pivot support for operably connecting said device to the operating member, a rack member carried by said device, a weight means operably mounted on said rack member for advancing movement therealong, a motor operably associated with said rack member and said weight means for advancing said weight means along said rack member to change the pivoted position of said device, an actuating connection to said motor, and a position-sensitive shut-off means in said actuating connection to disconnect said motor from said actuating connection when said device is in a predetermined pivoted position.

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