

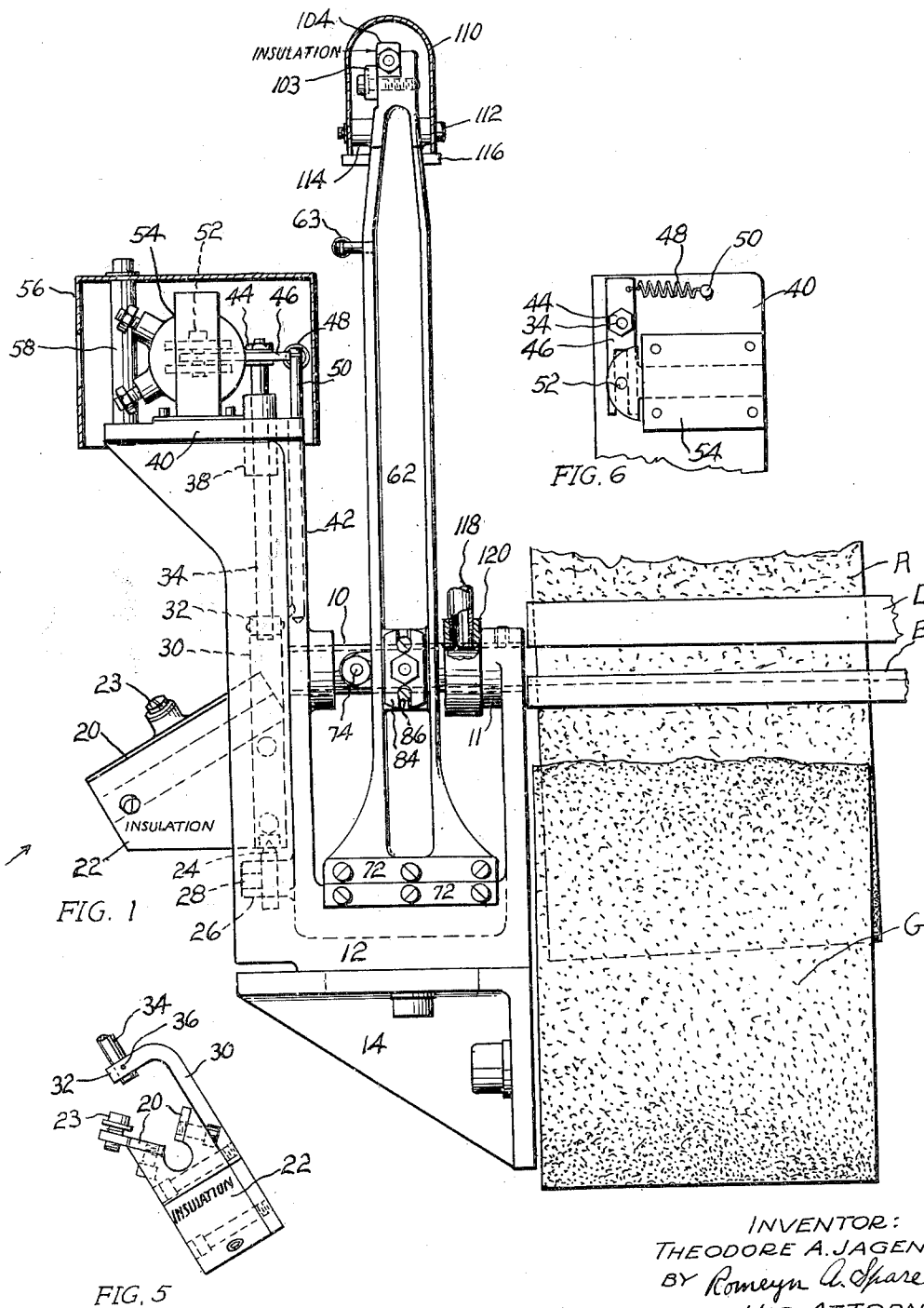
Nov. 1, 1949

T. A. JAGEN
GRINDING MACHINE

2,486,950

Filed Feb. 4, 1946

3 Sheets-Sheet 1



INVENTOR:
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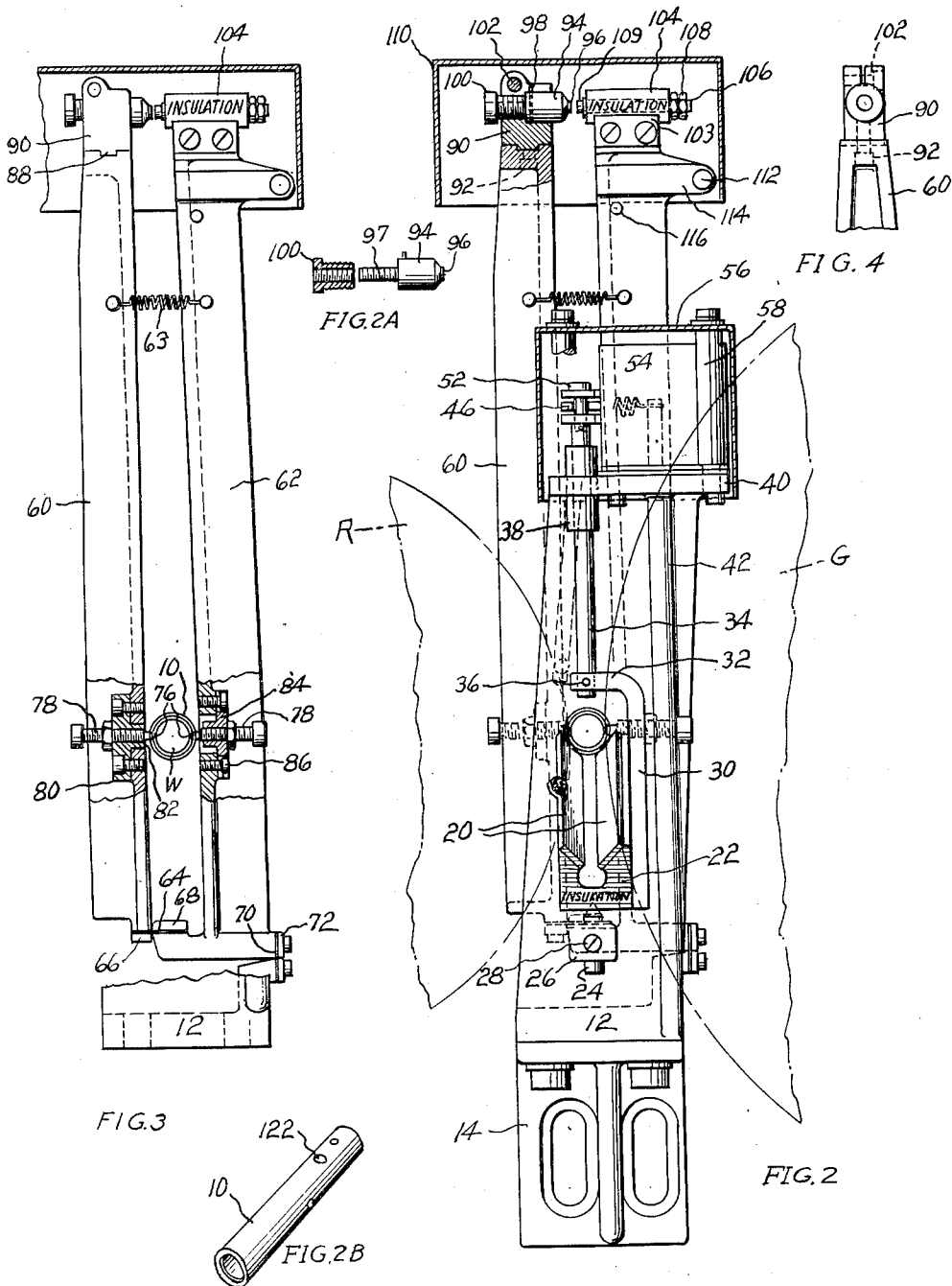
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3 Sheets-Sheet 3

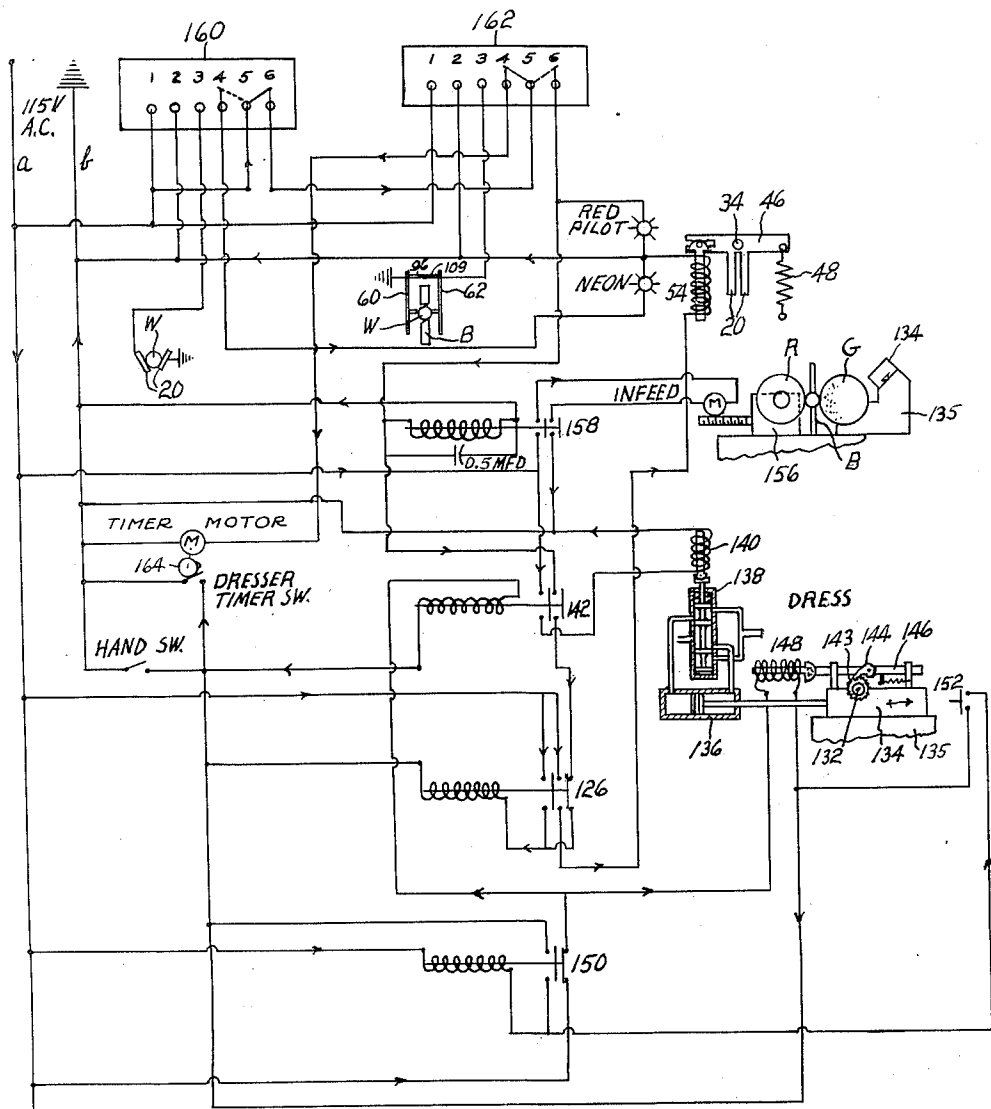


FIG. 7

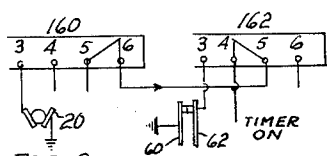


FIG. 8

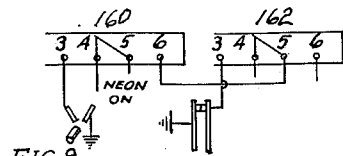


FIG. 9

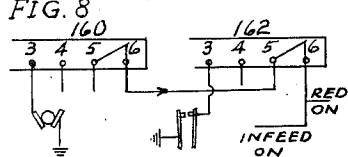


FIG. 10

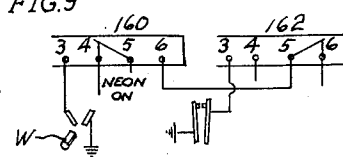


FIG. 11

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UNITED STATES PATENT OFFICE

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GRINDING MACHINE

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Application February 4, 1946, Serial No. 645,299

17 Claims. (Cl. 51-103)

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This invention relates to grinding machines and comprises all of the features of novelty herein disclosed. An object of the invention is to provide improved apparatus for gauging round articles while being machined or ground. Another object is to provide improved apparatus for controlling the size of a series of articles fed through a grinding machine and maintaining as nearly as possible a continuous grinding operation. Another object is to provide a gauging device which can float with the work and whose accuracy is not affected by foreign particles or impaired by transitory displacements of the gauging contacts. Another object is to provide an electrically actuated sizing device whose accuracy is enhanced by the complete elimination of arcing or pitting of contacts, as by the use of vacuum tubes or electronic relays which can be actuated by extremely low currents. Still other objects are to provide automatic control of centerless grinding machines and the like, as by keeping the grinding throat of proper width, dressing the grinding wheel at appropriate intervals, and segregating oversize or improperly finished rollers that may result from the necessary short interruption to grinding that occurs when dressing.

To these ends and also to improve generally upon apparatus of this character, the invention consists in the various matters hereinafter described and claimed. In its broader aspects, the invention is not necessarily limited to the specific construction selected for illustrative purposes in the accompanying drawings in which

Fig. 1 is a side elevation with parts broken away or in section.

Fig. 2 is a front elevation, partly in section.

Fig. 2A is a detail view of a grounded gauge contact.

Fig. 2B is a perspective view of the gauging tube.

Fig. 3 is a front view partly in section of the gauging levers and associated parts.

Fig. 4 is a side view of a portion of one gauging lever.

Fig. 5 is a view of a discharge chute looking in the direction of the arrow in Fig. 1.

Fig. 6 is a plan view of a portion of the chute operating mechanism.

Fig. 7 is a diagram.

Figs. 8, 9, 10 and 11 are diagrams based on Fig. 7 and showing various positions of relays in a pair of electronic switches.

Important functions consist in passing cylindrical work axially in a stream through a centerless grinder, gauging the work as it leaves the grinder and before it is discharged into a receptacle in order to control a narrowing of the grinding throat when the latter becomes too wide as a result of wheel wear, automatically

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dressing the wheel at infrequent but timed intervals and, when dressing the wheel and for a period of renewed grinding, diverting the resulting oversize and rough work from the course of the acceptable work. The apparatus employs a laterally floating gauge embracing the stream of work pieces and so constructed and controlled that its accuracy is unaffected by small chips or other foreign particles or by any transitory displacements or fluttering of the gauging elements, the gauge contacts being connected to an electronic time delay relay which requires only a very low current actuating circuit. The apparatus detects and signals when the flow of work stops by means of a second electronic time delay relay which is controlled by the presence or absence of work in a discharge chute.

The work W, such as cylindrical rollers which may have chamfered or radiused ends, passes in a stream between a regulating wheel R and a grinding wheel G while supported on an angle-top work blade B and while retained from buckling upwards by a work guide D. It then passes into a gauging tube 10 supported in bosses 11 in upright legs of a standard having its base 12 bolted to an angle bracket 14 on the frame of the grinding machine. After passing a pair of gauging members which project through opposite openings in the gauging tube and after being gauged as hereinafter described, the work drops into a swingable discharge chute comprising opposite wear plates 20 secured to inclined surfaces on a block of insulation 22. One of the wear plates has a lug with a binding post 23 for electric wiring to connect it to an electronic switch. The other plate is grounded. At the bottom of the block is a depression to receive a circular insert with a conical surface resting on a cone-pointed pivot screw 24 which is clamped in a lug 26 on the standard by a set screw 28. To provide an upper pivot in line with the pivot screw 24, an angle plate 30 is fastened to the side of the block 22 and has a horizontal arm 32 in which a vertical shaft 34 is secured by a press fit and a pin 36.

The shaft extends upwardly through a bearing bushing 38 which has a press fit in a platform 40 on the taller leg 42 of the standard. Fastened to the shouldered upper end of the shaft by a nut 44 is a forked lever 46 one end of which is connected by a coil spring 48 to an anchor post 50. The forked end of the lever is connected by a pivot pin 52 to the plunger of a pull-solenoid 54 which is fastened to the platform. The solenoid and the lever are enclosed in a guard 56 which is supported by shouldered posts 58 on the platform. Energizing of the solenoid swings the discharge chute to one side to eliminate articles which do not pass the gauging test when the grinding wheel is being trued.

The solenoid is kept energized throughout the truing cycle and for an additional interval to also eliminate some articles which are of acceptable size but of unsatisfactory finish.

Two gauging levers straddle the gauging tube 10. The left hand lever 60 is urged towards the right hand lever 62 by a connecting coil spring 63. Lever 60 is hinged to the lever 62 by a horizontal leaf spring or reed 64 fastened by straps 66 and 68. The right hand lever 62 thus supports the left one and is itself pivotally supported by a vertical reed 70. The reed 70 is fastened to lever 62 and to a face of the base 12 by straps 72. Gravity urges both levers anticlockwise but such movement is limited by a stop screw 74 carried in a lug of lever 62 and arranged to engage the gauging tube 10 as shown in Fig. 1. Normally the work controls the position of the gauge levers and the gauge will bodily follow any slight lateral movement of the work.

The gauging tube has a pair of opposite openings in line with larger openings in the levers. Diamond gauge points 76 engage opposite sides of the work, each being carried on a holding screw 78 having a lock nut. The left screw is threaded in a rectangular plate 80 which is fastened by screws to a face of the lever 60 in a channel thereof, the plate having a round extension 82 projecting in the hole of the lever. The right screw is similarly supported except that its holding plate 84 is vertically adjustable on the lever 62 in order to get the gauge points in line. Plate 84 has upper and lower forks to receive clamping screws 86. The two gauge points 76 lightly embrace opposite sides of the work W and can float laterally therewith to a limited extent without detriment to gauging, the work necessarily having some clearance with the gauge tube through which it passes.

To multiply the sensitivity of the gauge, the levers 60 and 62 are extended upwardly and provided with relatively movable electric contacts for a control circuit. At the top of lever 60 is a groove receiving a tongue 88 on a split bearing 90 which is fastened to the lever by a screw 92. An enlarged head 94 having a tungsten point 96 at one end and a reduced threaded extension 97 at the other is adjustable axially in the bearing while held from rotation by a pin 98 slidable in the slit of the bearing 90. The threaded extension 97 of the head 94 is threaded in a differential screw 100 which has external threads of a different pitch in the bearing 90. Adjustment is maintained by a clamping screw 102. Fastened by a clamping plate 103 and screws in a notch at the top of the other lever is a block of insulation 104 through which passes a headed stud or shaft 106 secured by nuts 108. The shaft 106 is also tipped with a tungsten point 109 to engage the point 96.

As shown in the diagram, the contact 96 is grounded and the contact 109 is wired to an electronic switch. When the work is under the maximum limit as in normal grinding, the two contact points remain in engagement and complete a low voltage circuit without any arcing or pitting of the contacts. This current is amplified as will appear to effect control of the machine. The contacts are enclosed in a U-shaped guard 110 which is supported by a hinge pin 112 passing through the guard and through lugs 114 on the lever 62. A pin 116 on the lever 62 holds the guard in horizontal position. To clean the work as it passes through the gauging tube 10 before reaching gauging position, a supply pipe 118 for

grinding coolant is threaded in an opening in a collar 120 fastened to the tube, the latter having an opening 122 communicating with the pipe to deliver fluid to the work and wash it off.

The work is pushed in an endless stream to the centerless grinder by any suitable feeder. The ground work passes into the guide or gauging tube 10 where it is gauged and then slides down the inclined wear plates 20 of the swingable chute. If the work is of acceptable diameter, the chute remains in its original position and the work drops into a bin or receptacle for the acceptable pieces. Under certain conditions, as when dressing of the grinding wheel unduly increases the width of the grinding throat, the work will not be sufficiently ground and will enter the gauging tube in an oversize condition. The gauge will detect this as will appear from the diagram and cause the solenoid 54 to be energized thereby swinging the chute to one side to deposit the rollers in a separate bin. The solenoid 54 is controlled by a contactor 126 having two blades associated with three pairs of contacts. One pair is normally closed and the other two pairs normally open. This contactor is controlled by a timer motor which at infrequent intervals causes a cam to close a dresser timer switch for a short period.

A dressing diamond 132 is mounted on the end of a screw shaft which is carried by a dresser slide 134 slidable on the grinding wheel head 135. The slide is reciprocated to carry the diamond across the wheel by a piston and cylinder unit 136 controlled by a valve 138 and a solenoid 140 which is energized whenever a contactor 142 having a pair of blades is moved to circuit closing position. The diamond shaft carries a ratchet wheel 143 engaged by a feed pawl 144 on a sliding bar 146 actuated in one direction by a solenoid 148 and in the opposite direction by a coil spring. As the slide 134 reaches the end of its stroke, it closes a microswitch 152 and energizes the coil of a contactor 150 which breaks the circuits to the dresser solenoid and the contactor 142.

To compensate for ordinary wear of the grinding wheel and thus avoid undue increase in the width of the grinding throat from that cause, the regulating wheel R is mounted on a slide 156 having a geared down connection with an infeed motor wired to a contactor 158 having two normally open blades. This contactor is energized to operate the infeed motor under control of the gauge which is associated with two electronic switches 160 and 162.

The electronic units or switches 160 and 162 are well known and procurable in the open market. They are known as vacuum tube time delay relays with a low current actuating circuit and are supplied with an adjustable time delay. In the left hand unit 160, the circuit is so designed that there is a source of low voltage between the terminal 3 and the grounded side b of the power supply, as when metallic work pieces are sliding down the discharge chute and electrically connecting the wear plates 20. When terminal 3 is thus grounded as in normal grinding, a minute current of less than one milliamperes flows through the connection and the tube does not conduct, the relay is unenergized and relay contacts 5 and 6 will be together. The relay contacts hold this position for a selected time interval, say two seconds, even after the external circuit is broken, as when a stoppage of work feed occurs and the last piece then in the chute slides out and has been gone for two seconds. The tube then con-

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ducts and causes current to flow through the relay so that contact 5 will switch over to contact 4 and stay there until the actuating circuit is closed again, as by resumption of work feed. No temporary breaking of the circuit for less than the selected two seconds, as by a temporary halt in the stream, will cause this switching of contact 5 to contact 4. The reason for this delayed action is not only to detect a genuine stoppage of the flow of work from the gauge assembly and flash a warning light but also to make sure the infeed motor will not run to narrow the grinding throat.

In the right hand electronic unit 162, there is also a source of low voltage between terminal 3 and the grounded side of the power supply but this circuit is so designed that relay contact 5 will not engage contact 4 until a timed interval, say two seconds, after the ground is established. These contacts then remain connected as long as the gauge contacts 95 and 109 maintain the grounded connection, as they will do in normal grinding while the work is under the high limit. If the work reaches the high limit, the contacts separate, the relay is immediately de-energized and contact 5 will switch over to contact 6. This starts the infeed motor and narrows the grinding throat so that the gauge contacts 95 and 109 ultimately come together and re-establish the grounded connection. However, this grounded connection does not cause contact 5 to engage contact 4 until the timed interval is elapsed. Thus any repeated closing and opening of the actuating circuit, provided the duration of closing is less than two seconds, will enable relay contacts 5 and 6 to remain connected. This enables the infeed motor to run in spite of any intermittent closing of the gauge contacts such as might be caused by short reduced portions on the rollers or chamfers on the ends of abutting rollers as they pass by the gauge.

Assuming normal grinding conditions with a continuous flow of rollers under the maximum size limit passing through the gauge, the dresser timing switch and the hand switch being open, the relay contacts 4 and 5 in the electronic unit 162 will be closed because terminal 3 is grounded through the gauge. At the electronic unit 160, relay contacts 5 and 6 will be closed because terminal 3 will be grounded through the work in the chute. Contactors 126, 142 and 150 will be unenergized and hence the chute solenoid 54, the dresser solenoid 148 and the valve solenoid 140 will be unenergized. Contactor 158 will be unenergized and the red pilot light will be unenergized because relay contacts 5 and 6 of unit 162 are open. Since contactor 158 is unenergized, the infeed motor and the slide 156 will be stationary, the neon light will be out because the continuous flow of rollers maintains the grounded circuit to terminal 3 of unit 160 and hence relay contacts 4 and 5 are open. The timer motor will be in operation because the circuit from line *a* through contacts 5 and 6 of unit 160 and through contacts 4 and 5 of unit 162 to line *b* is completed through the timer motor. This last is the only thing energized under these conditions aside from the two electronic switches. Hence, at the desired infrequent intervals, the timer motor will close the dresser timer switch for a short interval and thereby cause the dressing operation referred to more in detail hereinafter. The positions of the relays in the two electronic switches for the above condition of normal running are indicated in Figs. 7 and 8.

Assume now that grinding wheel wear has so

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enlarged the grinding throat that the work reaches the high limit and is about to go oversize, other conditions remaining the same. The positions of the relays under these conditions is indicated in Fig. 10. The gauge contacts are then separated by the high limit work. Since there is no longer any grounded connection for more than two seconds to terminal 3 of unit 162, contacts 5 and 6 close while contacts 4 and 5 open. A circuit is thus completed from line *a* through contacts 5 and 6 of unit 160 and contacts 5 and 6 of unit 162 to the red pilot light which is wired to grounded line *b*. A branch circuit is also completed through the coil of contactor 158 to line *b*. Thus the infeed motor is energized to move the regulating wheel towards the grinding wheel to reduce the diameter of the work in the grinding throat.

In addition to the above condition wherein wheel wear causes the rollers to reach the high limit, assume that the flow of rollers stops for some reason while a high limit roller remains in the gauge. See Fig. 11 where the gauge points are separated and all rollers in the chute have dropped out to break the ground at that point. Two seconds thereafter, contacts 4 and 5 of unit 160 close while contacts 5 and 6 open. As a result, the red pilot light is extinguished and the infeed motor stops. The neon bulb will be lighted as a signal to the operator. Thus, except for the two electronic switches only the neon bulb will be energized. As soon as obstruction is removed and the flow of rollers is resumed, the terminal 3 becomes grounded through the rollers and contacts 5 and 6 of unit 160 will immediately close while contacts 4 and 5 open so that the conditions of Fig. 10 are restored with only the red pilot and the infeed motor energized. After the regulating wheel has reduced the width of the grinding throat so that rollers ground under the high limit reach the gauge, the gauge contacts come together. Two seconds thereafter, relay contacts 4 and 5 of unit 162 will close while 5 and 6 open. The normal running position of Figs. 7 and 8 is re-established with only the timer on.

Assuming the normal grinding conditions again as the parts appear in Figs. 7 and 8, this normal condition should continue without interruption except for infeed until it is necessary to dress the grinding wheel. The time for dressing is controlled by the timer motor having a cam 164 which eventually closes the dresser timing switch for an interval. The dresser solenoid 148 is energized and so is the coil of contactor 142 which closes the blades and energizes the valve solenoid 140. The dresser is thus indexed by the pawl and ratchet to move the diamond closer to the wheel a short distance. The valve solenoid causes the dresser actuating piston to actuate the slide 134 and traverse the diamond along the wheel. Removing material from the wheel naturally results in the work becoming oversize. Relay contacts 5 and 6 of unit 162 will close as in Fig. 10, stopping the timer, and energizing the red pilot, the infeed motor, the contactor 126, and the chute solenoid 54 which diverts the oversize work.

The circuit for contactor 126 is completed from line *a* through the relay contacts 5 and 6 of both units 160 and 162, across the now closed outer blade of the contactor 142 and through the coil of contactor 126 and the temporarily closed timer switch to the grounded line *b*. When contactor 126 becomes energized, its normally

closed contacts will open thus breaking the circuit through the outer blade of the contactor 142 and through the coil of contactor 126 but the inner pair of the normally open contacts of contactor 126 immediately recloses the coil circuit directly while the middle pair completes a direct circuit through the chute solenoid 54. Thus relay contacts 5 and 6 of unit 162 initiate the operation of contactor 126 but this control is immediately removed therefrom and transferred to the now-closed dresser timing switch only, so that contactor 126 and the chute solenoid will become de-energized only when the dresser timing switch is subsequently opened. The reason for this transfer of control is to keep the chute solenoid energized with the chute in rejecting position for an interval of time including the time of dressing, subsequent infeed and until some subsequent rollers have been ground to size and rejected. Thus some rollers acceptable as to size will be rejected but these will be rough or have diamond marks due to the recent dressing of the grinding wheel.

When the dresser slide has traversed completely across the grinding wheel, it strikes the normally-open microswitch 152 and closes it. This energizes the contactor 150 which in turn locks itself in by the direct circuit through its coil and its normally-open but now-closed inner blade. When contactor 150 is energized, its outer blade breaks the circuit to the dresser solenoid 148 and breaks the branch circuit to the coil of contactor 142. The release of contactor 142 opens the circuit to the valve solenoid 140 so that a spring will return the valve to its original position thus reversing the dresser slide and opening the microswitch 152.

After the rollers are reduced to the proper size, relay contacts 4 and 5 of unit 162 will close, thus de-energizing contactor 150, the infeed motor, and the red pilot, while the timer motor is energized. After a predetermined time interval, depending on the number of rough but properly sized rollers to be rejected, the timer cam will cause the dresser switch to open and thus de-energize contactors 126 and 150 which action de-energizes the chute solenoid. The chute then swings back in line with the receptacle which takes the acceptable rollers. The conditions of Figs. 7 and 8 are restored. The oversize and rough rollers which were rejected can be collected and passed through the grinding machine to bring them to correct size and finish.

Another possible position of the relays indicated in Fig. 9 shows what happens if the flow of rollers be interrupted while acceptable rollers are passing through the gauge. Compared with Fig. 8, the only result would be to cause contacts 4 and 5 of the unit 160 to close, the timer being stopped and the neon light being the only thing energized except for the two electronic switches. Two seconds after the last roller leaves the chute, the contacts 4 and 5 of unit 160 assume the indicated position for the same reason that they do so in Fig. 11.

Thus, if there is no stoppage in the flow of rollers through the machine, all rollers of acceptable dimensions will be segregated in a continuous operation. Whenever wear of the wheels causes the work to reach the high limit, the gauge contacts separate and the regulating wheel is fed in to narrow the throat, this feed stopping before it proceeds too far because a roller ground under the high limit soon reaches the gauge and allows the gauge contacts to come together. At rather wide intervals the timing motor will start

a dressing operation and since this will cause oversize rollers to be produced, the diverting chute is swung to one side to segregate those rollers, and since the chute is held to one side for a time by the timing device, some rough rollers of acceptable size are also diverted. There are few of either kind at these infrequent intervals and they are available for collection and subsequent passage through the machine.

I claim:

1. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, means for conducting work pieces of acceptable size to one destination, a dressing diamond, mechanism for automatically traversing the diamond across the wheel at intervals, and means for directing oversize work pieces resulting from the dressing operation to a destination different from the acceptable pieces.

2. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a dressing diamond, mechanism for traversing the diamond across the wheel, a timing motor for causing said traversing movement to occur at intervals, and means for causing the work pieces which pass the wheel during the dressing operation to be separated from the others.

3. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, means for conducting work pieces of acceptable size to one destination, a dressing diamond, mechanism for traversing the diamond across the wheel at intervals, means for causing relative movement of approach between the wheel and the work to compensate for the material removed from the wheel, and mechanism operable during said dressing operation and said movement of approach to divert a series of work pieces from the course of the acceptable pieces.

4. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a dressing diamond, mechanism for traversing the diamond across the wheel, mechanism for causing the diamond to approach the wheel, and a timing motor for causing both said movements to occur at intervals while the work pieces continue to pass the wheel.

5. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a movable exit chute receiving the ground work pieces, a dressing diamond, mechanism for traversing the diamond across the wheel, a timing device for starting said mechanism at intervals, and means for moving the chute to divert oversize work pieces from the course of acceptable ones when the diamond removes material from the wheel.

6. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a movable exit chute receiving the ground work pieces, a work gauge between the wheel and the chute, a dressing diamond, mechanism for traversing the diamond across the wheel, a timing device for starting said mechanism at intervals, and means controlled by the gauge for moving the chute to divert oversize work pieces from the course of acceptable ones when the diamond removes material from the wheel.

7. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a movable exit chute

receiving the ground work pieces, a work gauge between the wheel and the chute, a dressing diamond, mechanism for traversing the diamond across the wheel, a timing motor for starting said mechanism at intervals, means controlled by the gauge for moving the chute to divert over-size work pieces from the course of acceptable ones when the diamond removes material from the wheel, and mechanism for causing a relative movement of approach between the wheel and the work to compensate for said removal of material.

8. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, an infeed slide having an actuating motor for causing a relative movement of approach between the wheel and the work when the wheel wears, a work gauge engaging the ground work and having a pair of electric contacts adapted to open and close a circuit in accordance with the size of the work, and an electronic time delay relay controlled by the contacts to effect operation of the motor when the work reaches a limit of size and to maintain said motor in operation for a predetermined time independently of a subsequent closing and opening of the contacts.

9. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, an infeed slide having an actuating motor for causing a relative movement of approach between the wheel and the work when the wheel wears, a work gauge having a pair of contacts which separate when the work reaches its high limit of size as a result of wheel wear, means controlled by said gauge for starting the motor to reduce the size of subsequent work pieces, said means having a predetermined time delay to prevent stopping of the motor if the contacts engage for less than the predetermined time.

10. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a discharge chute to receive ground work pieces as they travel beyond the wheel, the chute having spaced wear plates to be electrically connected by a metallic work piece in the chute, and means energized upon the absence of a work piece in the chute to detect a stoppage in the flow of work pieces across the wheel.

11. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, an infeed slide for causing a relative movement of approach between the wheel and the work when the wheel wears, a motor for actuating the slide, an inclined exit chute receiving the ground work pieces and having spaced plates electrically connected by the work, and an electronic switch connected to one of the plates and having a time delay relay to postpone stopping of the motor for a predetermined time after all work pieces have dropped from the chute.

12. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a guide for supporting the ground work pieces as they travel beyond the wheel and having lateral clearance with the work pieces, a work gauge, mechanism actuated by the gauge for controlling the size of the work, the gauge having a pair of feelers engaging opposite sides of the work in the guide, and means supporting the gauge for lateral movement with the work.

13. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a guide for supporting the ground work pieces as they travel beyond the wheel and having lateral clearance with the work pieces, a work gauge, mechanism actuated by the gauge for controlling the size of the work, the gauge having a feeler engaging the work pieces as they pass through the guide, means supporting the gauge for lateral movement as a unit with the work, and means for conducting a washing fluid to the guide to remove grit from the work and the guide before the work reaches the gauge.

14. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a guide for supporting the ground work pieces as they travel beyond the wheel and having lateral clearance with the work pieces, a work gauge, mechanism actuated by the gauge for controlling the size of the work pieces, the gauge having a pair of pivotally connected levers straddling the guide, a pair of feelers carried by the levers and engaging opposite sides of the work, and a pivotal mounting for the connected levers to provide for their lateral movement as a unit with the work.

15. In a grinding machine having a grinding wheel and means to traverse work pieces in succession across the wheel, a guide for supporting the ground work pieces as they travel beyond the wheel, a work gauge having a pair of levers straddling the guide, a pair of feelers carried by the levers and urged against opposite sides of the work, a pair of electric contact members carried by the levers, and means controlled by the relative positions of the contact members for controlling the size of the work subsequently traversing the wheel.

16. In a centerless grinding machine having a grinding wheel, a regulating wheel and a work support, mechanism for traversing work pieces in a continuous stream between the wheels, automatic mechanism for dressing the grinding machine at intervals without interruption of the flow of work pieces, and means for diverting from the course of acceptable pieces those moving pieces which are rendered unacceptable by the dressing operation.

17. In a centerless grinding machine having a grinding wheel, a regulating wheel and a work support, mechanism for traversing work pieces in continuous stream between the wheels, mechanism for causing relative movement of approach between the grinding wheel and the work as a result of wheel wear, and mechanism for preventing such approach if any stoppage in the flow of pieces should occur.

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