July 4, 1944. A. G. B. METCALF 2,352,650

GRADING MACHINE

Filed June 21, 1941 4 Sheets-Sheet 1

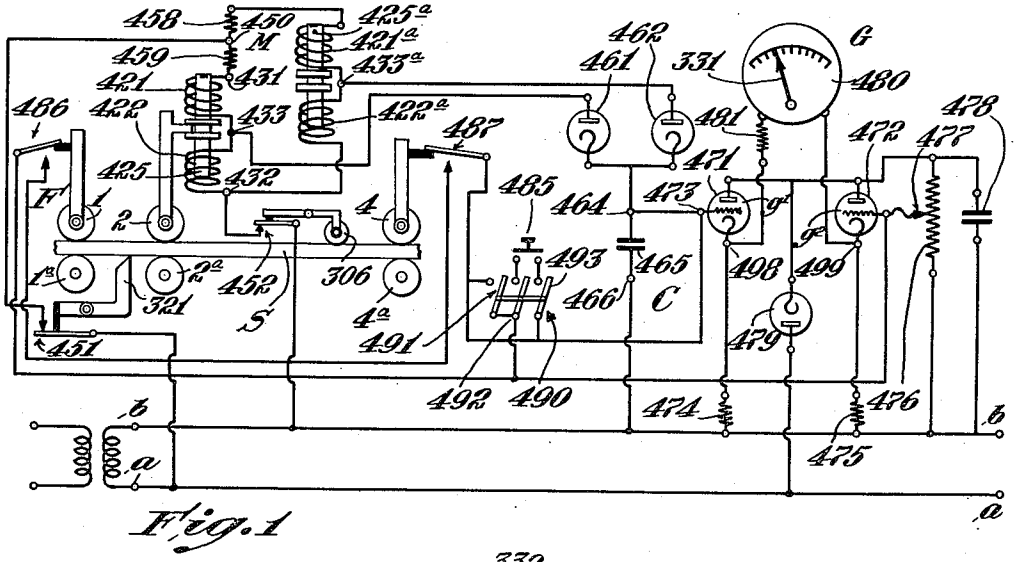


Fig. 1

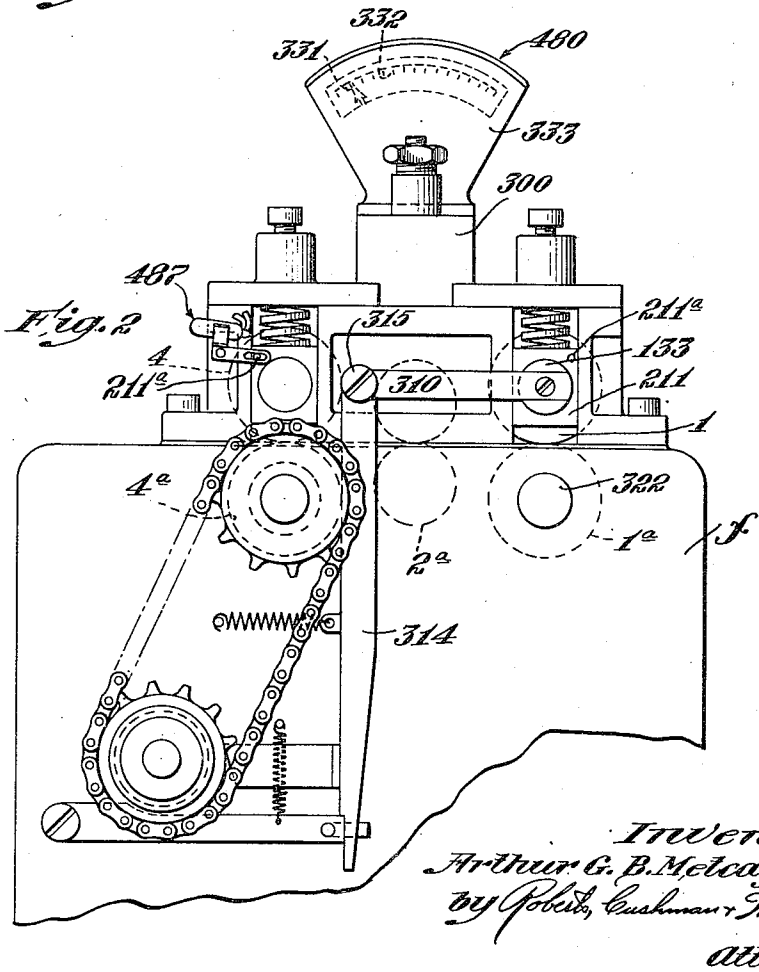


Fig. 2

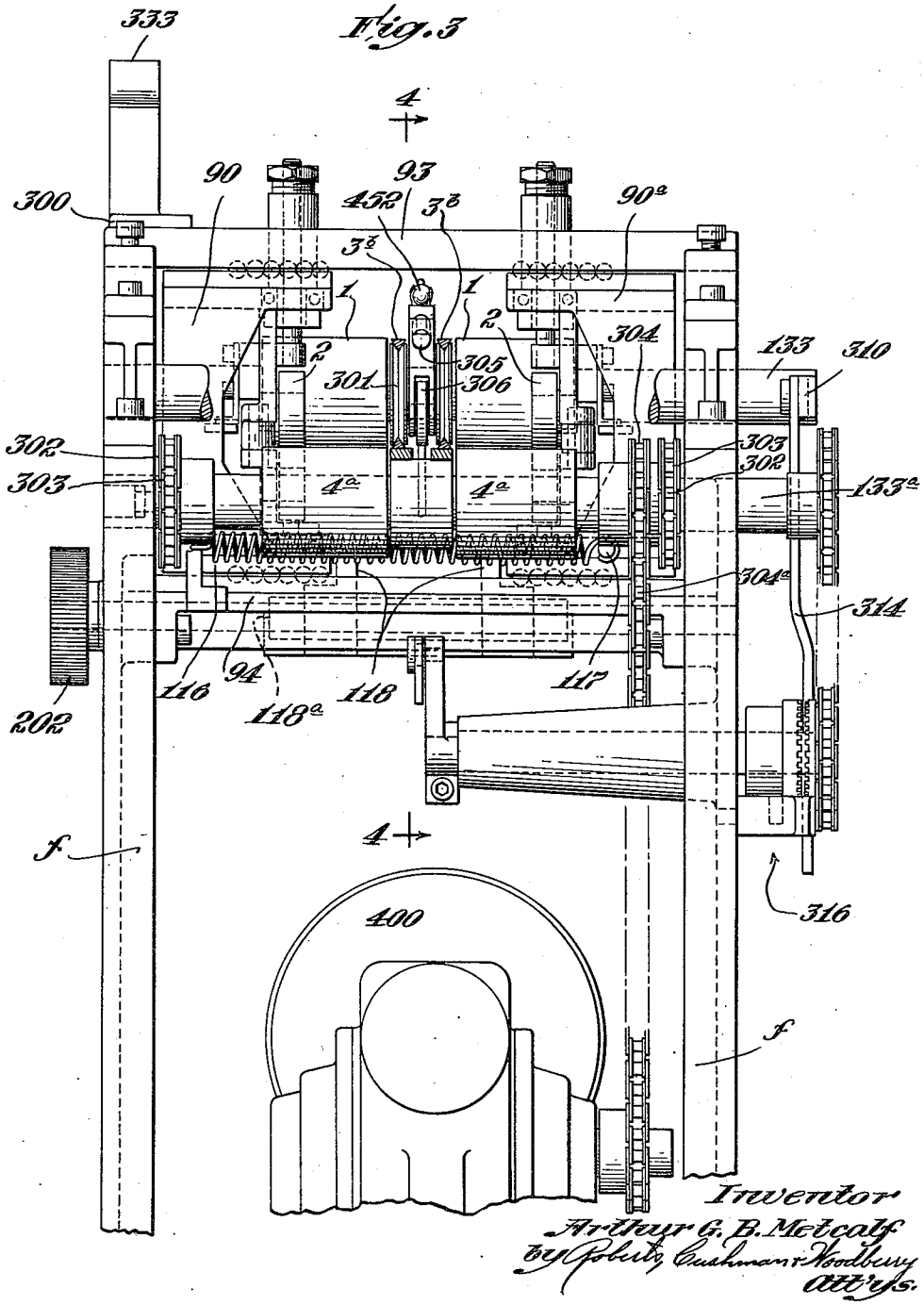
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GRADING MACHINE

Filed June 21, 1941 4 Sheets-Sheet 2

Fig. 3



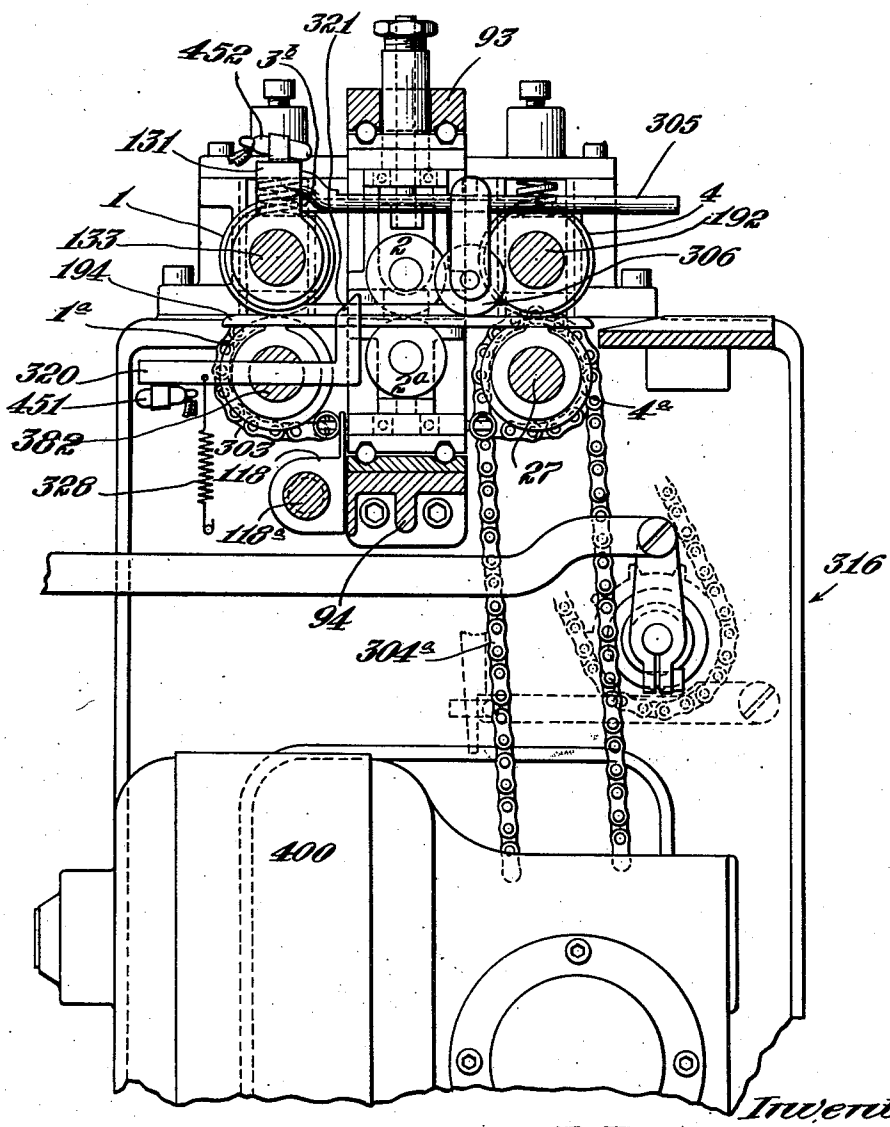
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GRADING MACHINE

Filed June 21, 1941 4 Sheets-Sheet 3

Fig. 4



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GRADING MACHINE

Filed June 21, 1941 4 Sheets-Sheet 4

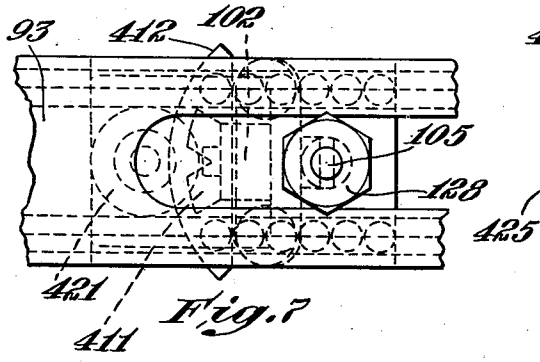


Fig. 7

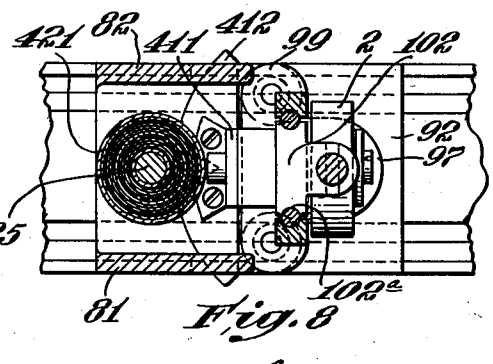


Fig. 8

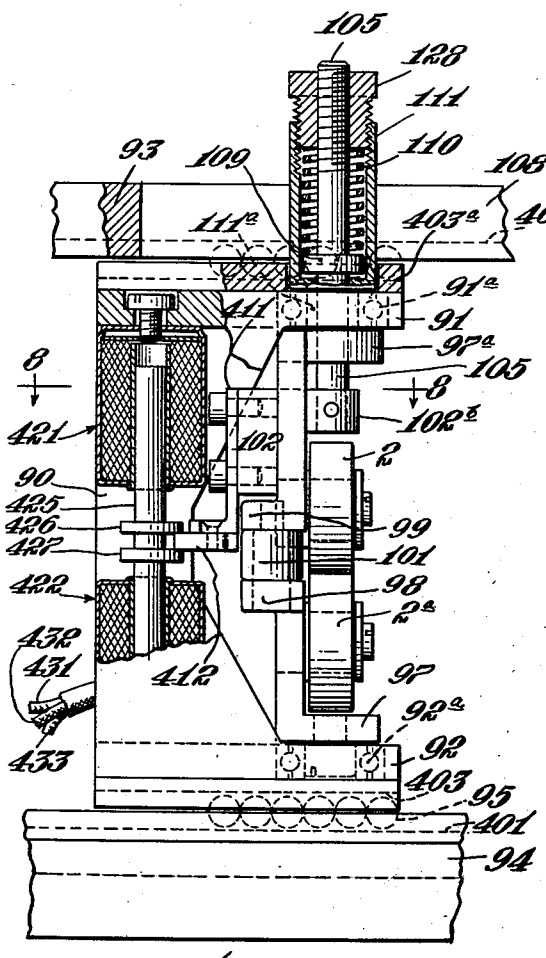


Fig. 6

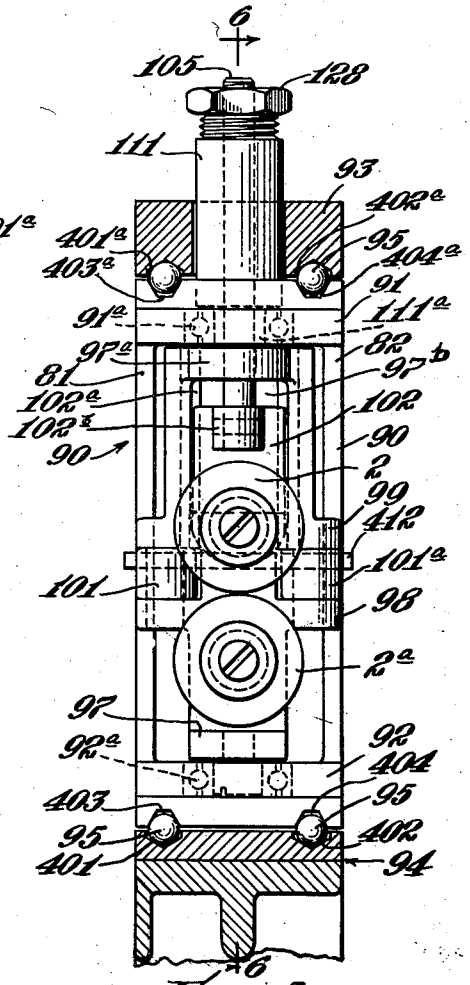


Fig. 5

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UNITED STATES PATENT OFFICE

2,352,650

GRADING MACHINE

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Application June 21, 1941, Serial No. 399,088

14 Claims. (Cl. 33—147)

This invention relates to grading machines such as are used to grade shoe soles, taps and other blanks of stock used in the manufacture of shoes, and more particularly to the well-known Nichols type of grading machines illustrated in a series of patents granted to Elmer P. Nichols, Leander A. Cogswell, and James W. Johnston, of which the Johnston Patent No. 2,187,304, dated January 16, 1940, may be referred to as an example. A characteristic feature of such grading machines is that each blank is measured and graded in accordance with the thickness of the thinnest spot of the blank, or of a selected area of the blank, as determined by the detecting and measuring devices.

There are various kinds of grading operations performed by different species of grading apparatus, and the term "grading," as established in this art, is a generic term and includes indicating on a visual indicator the grades of the several blanks, evening or skiving the blank as a whole down to the grade or thickness of its thinnest spot, stamping or marking each blank with a character indicating its thickness grade, and sorting or distributing the blanks in accordance with their grade measurements. Two or more species of grading apparatus may be contained in one machine and the term "grading" is used herein in its generic sense unless some particular kind of grading is specified. Whatever may be the kind or kinds of grading to be performed the appropriate grading apparatus is adjusted through transmission apparatus in response to and in accordance with the thickness grade of each blank as determined by the detecting and gauging or measuring device, which acts on each blank as successive blanks are passed one by one through the machine. The measurements are usually made in terms of "irons" (1/48 of an inch), and the measurement transmitted to the grading devices is usually the thickness measurement in irons or fractions of irons which is nearest to but not greater than the thickness of the thinnest part of the blank as determined by the measuring device. In the machine herein illustrated only one type of grading mechanism is shown, namely a visual indicator, but it will be understood that additional or different species of grading mechanisms might be used, such as evening or skiving, stamping or marking mechanism, or distributors, and all such species are within the scope of the claims.

Grading machines of the aforesaid type usually include mechanical measuring and transmitting devices which introduce the objectionable features inherent in such devices, such as geometrical translation errors, complicated and therefore costly provisions for rectifying such errors, and mechanical linkages and transmissions which introduce other errors, exert disturbing reactive forces, necessitate bulkiness, and limit the grading speed which can be attained.

Systems of this type are improved according to my copending applications Serial No. 389,854, filed April 23, 1941, and Serial No. 399,087, filed June 21, 1941, by separating so far as mechanical force transmission is concerned, the measuring and grading mechanisms by introducing a grading control apparatus which has its own power supply and which is correlated to a member responsive to the measuring mechanism for the purpose of moving it into proper grading position after that position has been determined by that member, or by continuously correlating the measuring and grading mechanisms to proportionate settings.

It is one of the main objects of the present invention to provide for grading in the above-discussed sense by employing practically inertialess electrical apparatus avoiding the defects inherent in mechanical detecting and transmitting apparatus.

In another aspect, the invention provides measuring or thickness detecting apparatus whose mechanical parts are only related to the guiding and the actual calipering of the blanks; all other operations, as transmitting the caliper movements, eliminating the effect of the grading apparatus of thickness changes in a given direction, and setting the grading apparatus, are performed by purely electrical methods. A further feature of the invention is a measuring element utilizing impedance changes in an electrical circuit for transmitting measurements.

In additional aspects, the invention provides for electrically summating consecutively detected unidirectional measurement increments, for resetting the transmission and grading apparatus for a new operation cycle, and for the grading of only a preselected portion of the blank.

Further objects relate to various features of construction and will be apparent from a consideration of the following description and the accompanying drawings, wherein:

Fig. 1 is a diagrammatical representation of a grading machine described by way of example, including the electrical circuit;

Fig. 2 is a side elevation of the embodiment of

a grading machine schematically shown in Fig. 1, as constructed in accordance with the present invention and including a visual indicator as grading apparatus;

Fig. 3 is a rear elevation of the machine shown in Fig. 2, with the upper rear feed roll removed;

Fig. 4 is a section on line 4—4 of Fig. 3;

Fig. 5 is an elevation of a measuring element with the rails in section;

Fig. 6 is a front elevation, partly in section, on line 6—6 of Fig. 5;

Fig. 7 is a top view corresponding to Fig. 5; and

Fig. 8 is a section on line 8—8 of Fig. 6.

The machine to be described by way of example of a device according to the invention comprises several apparatus groups, indicated as follows in Fig. 1. The blanks S are supplied to the machine proper by a feeding arrangement F, they then pass through a measuring device M, and are graded by a grading apparatus G; measuring and grading devices are correlated by an electrical transmission apparatus C.

Feeding arrangement and drive.—In the embodiment herein described, the soles may be either automatically or manually fed to the machine, and removed by hand and segregated in accordance with the grade measurements noted on the visual indicator 480 which is rigidly secured to an upstanding bracket 300 (Figs. 1 and 2) fixed to the machine frame.

The sole to be measured is first presented to the continuously driven feed rolls 1 and 1ª (Figs. 1, 2, 3 and 4) which deliver it to the calipering rolls 2, 2ª. A pair of conveyor belts 3ᵇ carries the sole forwardly, presenting it to a second pair of feed rolls 4 and 4ª which propel it outwardly a distance sufficient to permit its forepart to be grasped by the operator.

The front feed rolls 1, 1ª are freely rotatable on the shafts 133 and 133ª, respectively (Fig. 4), the shaft 133 being journaled in boxes 211 (Fig. 2) mounted to slide in vertical ways secured to the machine frame *f*. The shaft 133ᵃ is journaled in fixed bearings in the machine frame. The rear feed or transport rolls 4 and 4ª are fast to shafts 192 and 27, respectively (Figs. 2 and 4) the shaft 192 being journaled in boxes 211ª slidable in vertical ways in the machine frame and the shaft 27 being journaled in fixed bearings in the frame. The inner ends of the upper feed rolls 1 and 4 are provided with grooved pulleys 301 (Fig. 3) which carry the V-shaped conveyor belts 3ᵇ or other suitable conveyor means. The outer ends of the lower feed rolls 1ª and 4ª are provided with sprocket wheels 302 (Figs. 3 and 4) which carry drive chains 303. The shaft 27 is provided with a sprocket wheel 304 which is connected by drive chain 304ª to motor 400 (Figs. 3 and 4), whose operation may be controlled in any suitable manner.

A horizontally extending arm 305 is rigidly secured to a holder 131 fast to shaft 133 and this arm 305 carries a start-grader roll 306 adjustably mounted thereon so that its positions along the arm 305 can be varied. A switch 452, for example a mercury switch, is fastened to arm 131 (Figs. 3 and 4). This arrangement causes roll 306 to be engaged and raised by a blank passing through the machine, switch 452 being then tipped to close its contacts. The start grader roll 306 is positioned between the calipering rolls 2, 2ª and the feed rolls 4, 4ª, as illustrated in Figs. 1 and 4.

An arm 310 (Figs. 2 and 3) may be rigidly secured to shaft 133 so as to swing in response to rocking of that shaft due to movement of arm 305. A depending arm 314 may be pivotally secured at 315 to the arm 310, the arm 314 being associated with a clutch mechanism 316 adapted to control an arrangement for feeding of soles to the machine, which arrangement is not essential to the present invention and is described in my copending application Serial No. 366,853, filed November 23, 1940.

A stop grader tripper 320 (Figs. 1 and 4) is adjustably secured to shaft 133ª with its nose-like end 321 normally projecting into the path of travel of a sole blank being fed by rolls 1, 1ª to the calipering rolls 2, 2ª, so as to be depressed thereby with consequent rocking of shaft 133ª. A tension spring 328 (Fig. 4), one end of which is connected to the machine frame and the other end to the tripper 320, urges the latter upwardly and normally maintains it with its nose projecting into the blank path.

A mercury switch 451 is fastened to tripper arm 320. This switch is open so long as the tripper is in raised position. When the leading end of a sole depresses tripper nose 321, the shaft 133ª is rocked thereby swinging arm 320 and closing switch 451. When the trailing end of the sole passes beyond the tripper 320 the spring 328 becomes effective to open the switch. It will be noted that, since the position of the nose 321 of the tripper may be varied longitudinally of the path of the blank, the stop-grading means as well as the start-grading means is subject to adjustment so that the measurement of the blank may be confined to any desired part of its entire length, as will appear more clearly hereinbelow. During its passage between the feed or transport rolls, the blank rests on table 194 (Fig. 4) against which it is held by belts 3ᵇ.

Measuring device.—From feeding rolls 1, 1ª the blank passes, as above indicated, between the calipering elements constituting the detecting means of measuring device M.

For purposes of the present invention, calipering rolls passing over marginal portions of the blanks directly affect the impedance of the measuring portion of an electric circuit, in the following manner.

The measuring device comprises a pair of yokes 90, 90ª with side walls 81, 82 (Figs. 3 to 8) mounted on the machine frame *f* for transverse travel on two bridges or crosspieces 93, 94. The yokes are normally urged together by tension springs 116 (Fig. 3), one end of which is fastened to pins 117 on the yokes and the other end to the machine frame. In Fig. 3 the yokes are shown in extended position but normally they are drawn together until they contact stops 118. The stops may be adjusted by means of a screw spindle 118ª with right and left-hand threads to which a knurled knob 202 is fastened (Figs. 3 and 4). Each bridge has two races 401—402, 401ª—402ª, respectively, which correspond to yoke races 403—404, 403ª—404ª (Fig. 5), the yokes running in these races by means of balls 95.

Each yoke has an upper calipering roll 2, a lower calipering roll 2ª and two edge rolls 101, 101ª, which rolls are mounted on a bracket 97 pivoted in flanges 91 and 92 of yoke 90 by means of ball bearings 91ª and 92ª.

The edge rolls 101 rotate on pintles screwed into the upper ears 99 of the brackets, through bores in the lower ears 98.

The lower measuring rolls 2ª turn on pintles screwed into the bracket and the upper or caliper-

ing rolls 2 run on pintles similarly screwed into plates 102 sliding on wires 102a set into round grooves of bracket and slide plate, respectively (Fig. 8). A boss 102b of plate 102 is pinned to a spindle 105 extending upwardly through slot 108 (Fig. 6) of upper bridge 93. Plate 102 protrudes rearwardly through the window 97b of the bracket and carries an angle 411 to which is screwed a circularly curved actuator piece 412 having its center at the center line of spindle 105.

Rotatably supported within upper yoke flange 91 (Figs. 5 and 6) is the lower restricted portion 111a of a sleeve 111, by means of ball bearing 91a. Spindle 105 fits slidingly into sleeve portion 111a and a bore of upper bracket boss 97a. Spindle 105 has a collar 109, and a spring 110 is retained between this collar and adjustment screw 128 of sleeve 111.

By means of this arrangement, the yokes can move laterally, the brackets rotate in bearings 91a and 92a, and calipering roll 2 with actuator 412 move up and down on spindle 105.

Two coil units 421, 422 are screwed to the upper and lower flanges 91, 92, respectively, of yoke 90. The coils have a common armature 425 with two collars 426, 427 engaging actuator 412. Each pair of coils is connected to three terminals 431, 432, 433, as shown in Fig. 1, from which flexible wires (Fig. 6) lead to the electrical part of the apparatus which may be conveniently housed within the frame carrying the above-described apparatus.

A resetting switch 490 with normally open push button switch 485, which is closed for returning the indicator to zero reading after each blank has been graded, may be arranged on the frame in convenient location for operation by hand or with a pedal. This device can be automatically actuated upon removal of the blank, for example by connecting it with the upper transport rolls 1 and 4, as indicated in Fig. 1, which shows both manually and automatically operated switches. For that purpose, the upper feed roll boxes 211 may be provided with pins 211a, which, upon the respective rolls being lifted by the blank, open mercury switches 486, 487 fastened to the machine frame adjacent to the pins, as shown in Fig. 2. The connection and function of these switches will be explained below.

Grading device.—In the embodiment disclosed, the grading device consists in an electric instrument 480, in the present instance a milliamperemeter which is operated by the transmission device to be described below. This instrument moves a hand 331 on a scale 332, which, if the machine is used for grading shoe soles, will preferably be calibrated in "irons," as above discussed.

Instrument 480 is mounted within a housing 333 fastened with stand 300 to the front wall of the machine frame *f* (Figs. 2 and 3), which also carries knob 202 for adjusting the minimum distance of the calipering yokes 90, 90a. Referring to Figs. 1 and 3, the operator will stand facing dial 331—332 (whose back is shown in Fig. 2), feed the soles from the left-hand side and remove them on the right-hand side, sorting them according to the dial readings.

As pointed out above, the indicator may be replaced by stamping, skiving or sorting devices; a preferred construction combining such devices with the herein-described measuring and grading apparatus is described in my copending application Serial No. 399,087, filed June 21, 1941.

Transmission apparatus.—This apparatus is in the present instance purely electrical and comprises a detecting circuit, a discriminating circuit, a grading circuit, and a restoring circuit.

The detecting circuit includes the above-mentioned coils 421, 422 and 421a and 422a of the two calipering yokes 90, 90a, respectively, with their armatures 425, 425a (Figs. 1 and 6), the normally open stop grader switch 451 which is actuated by tripper 321, the normally open start grader switch 452 actuated by start grader roll 306, and the resistances 458, 459.

Coils 421, 422 and armature 425 of yoke 90, and the corresponding elements of yoke 90a are so arranged that, assuming a constant alternating potential difference to be applied to the terminals 431 and 432, the potential at the intermediate terminal 433 will increase when the armature moves towards the lower terminal 432, following a decrease of blank thickness as measured by calipering roll 2, which through actuator 412 controls armature 425. This purpose may be attained by providing a maximal air gap adjacent lower terminal 432 for that position of the armature which approximately corresponds to its maximum lift, that is, the maximum blank thickness. Any lowering of the armature, corresponding to decreasing blank thickness, will then increase the inductance of coil 422 and decrease that of coil 321, causing the potential at 433 to raise as compared to that at 432. In other words, lowering of the armature will shift the potential of 433 towards that of 431, and lifting the armature will shift it towards that of 432. Optimum inductance and hence potential changes will be obtained if the magnetic circuit is closed through iron with the exception of a varying gap (corresponding to that portion of coil 422 which Fig. 1 shows as not covered by the armature), which is of the order of the range of the thicknesses to be measured. As shown in Figs. 5 and 6, yoke 90 provides this magnetic circuit.

It will be understood that the herein shown double coil arrangement can be replaced by other electrical elements providing changes of potential level proportionate to movements thereof. For example, a single coil could be used with an armature normally displaced relatively thereto by an amount providing the above-mentioned optimum gap. This single coil would consist of portions 421 and 422, the wire leading to terminal 433 would be connected at 431 and the controlling potential shift become effective at 431.

As mentioned above, stop grader switch 451 and start grader switch 452 are closed so long as a blank is in contact with the corresponding feeler devices, namely, tripper 321 and roll 306, respectively.

The above elements are connected to a source *a*, *b* of alternating current in the detecting circuit *a*—451—450—459—431—421—433—422—432—452—*b*. The coils of the second calipering yoke, for the other side of the blank, are connected in a circuit 450—458—421a—433a—422a—432, in parallel to the coils of the first yoke.

It will be understood that only one potential adjusting device may be used, for example, if only one side of a blank is to be measured.

The circuit for discriminating inductance changes of different sense, in the detecting circuit, includes a condenser 465 and rectifying apparatus, for example, two diodes 461, 462, with their anodes connected to the intermediate coil terminals 433 and 433a, respectively, and their cathodes connected to terminal 464 of condenser

465. The other condenser terminal 466 is connected to source terminal *b*.

The grading circuit includes two triodes 471, 472 of similar type, two cathode resistances 474, 475, a potentiometer 476 with adjustable tap 477, a smoothing condenser 478, a diode 479 and a milliamperemeter 480 with series resistor 481. Two triodes are used in this circuit in order to insure correct meter readings in spite of changes in the tube characteristics due, for example, to warm-up. This purpose can be attained even better if, instead of using two separate triodes, a double triode in a single envelope is employed.

The anodes of both triodes are connected to source terminal *a* through rectifier diode 479, and the cathodes to source terminal *b* through resistors 474 and 475; the grid g^1 of triode 471 is at 473 connected, preferably through a high resistance (not shown), to plate terminal 464 of condenser 465; the grid g^2 of the other triode 472 is similarly connected to adjustable tap 477 of potentiometer 476; condenser 478 is in parallel to the potentiometer, and the meter 480 with resistor 481 is connected between the cathodes of the two triodes.

The restoring circuit includes a push button switch 485, and optionally in addition to the above-described feed roller controlled switches 486, 487, a change-over switch 490 with contact elements 491, 492, 493.

The feed roller controlled restoring switches 486 and 487 are connected in series between the grids of triodes 471 and 472, respectively; switch element 491 bridges switches 486 and 487, and elements 492 and 493 connect the two triode grids to the normally open push button switch if switch 490 is closed.

Operation.—Reference especially to Fig. 1, if a blank S is fed into the nip of feed rolls 1, 1^a it will be seized by these rolls and advanced between table 194 and conveyor belts 3^b, opening restoring switch 486 and thereby conditioning the instrument of the indicator for grinding. Shortly thereafter, tripper 321 is depressed permitting stop grader switch 451 to close.

The blank then arrives between the two pairs of calipering rolls 2, 2^a, lifting spindle 105 and armature 524.

The blank next arrives at start grader roll 306, lifting it and thereby closing switch 452 and completing the detecting circuit.

A potential difference properly apportioned by resistances 458, 459 and the coil impedances is now applied from source *a*, *b* to coils 421, 422 and 421^a, 422^a and an intermediate potential difference, depending upon the position of armatures 425, 425^a within their respective coils will exist between line terminal *b* and coil terminals 433 and 433^a, respectively. This last-mentioned potential difference is applied to condenser 465 through diodes 461, 462. Any further lifting of either one of armatures 425, 425^a will decrease this potential, but due to the rectifying effect of the diodes the condenser cannot discharge and its condition is not affected. The lowering of either armature, however, will raise the potential at 464 and increase the charge on condenser 465, which charge therefore is at any given time proportionate to the thinnest spot of the blank S so far encountered by either one of the calipering rolls 2 of yokes 90, 90^a, respectively.

The triodes 471, 472 are supplied with appropriate anode potential through rectifying diode 479 and resistors 474, 475. The grids g^1 and g^2 are normally, with switches 490 and 485, closed, at the same potential, namely, that determined by the position of tap 477 on potentiometer 476. This tap can be adjusted to set indicator 331 normally to zero. As pointed out above, errors due to tube variations are practically eliminated by using two identical tubes which compensate each other, for example, during the warm-up period.

Points 473 and 477 being at the same potential, the tubes will be equally conductive and with resistors 474 and 475 properly adjusted both cathodes will be at the same potential level and no current flows through meter 480. If the potential at 473 is, however, raised due to the connection of this point with condenser plate 464, triode 471 will become more conductive and the potential difference between points 498 and 499 will affect the instrument 480 proportionate to the potential difference across the condenser and hence to the thinnest spot of the blank at that moment under either of the two calipering rolls. In this connection it will be noted that switches 485, 486 and 487 are open during the grading proper, so that at that time grids g^1 and g^2 are free to assume different potentials.

Assuming that switch 490 is closed, the operator can conveniently remove the blank from rolls 4, 4^a, read the meter and put the blank into the appropriate receptacle. He then depresses switch 485 for a moment, thereby connecting points 473 and 477 and setting the meter back to zero, as well as discharging condenser 465.

If switch 490 is open, the resetting operation will be automatically performed; points 473 and 477 are connected through switches 486 and 487 as soon as the blank leaves feed roll 4. Feeding of a new blank into rolls 1, 1^a opens switch 486 and hence the resetting circuit, conditioning the measuring and grading circuits for a new cycle.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A grading machine comprising measuring means for detecting changes of thickness of articles moving relatively thereto in terms of variations of an electrical value, means for progressively storing electric energy proportionate to unidirectional changes of said value, means for grading said articles adapted to be adjusted in accordance with said changes, electrical transmission means including an element susceptible to said stored energy, for adjusting said grading means proportionate to said changes, and means for rendering said transmission means effective dependent upon the location of said article relatively to said detecting means.

2. A grading machine comprising detecting means responsive to variations of thickness grades of blanks of stock electric means including an impedance controlled by said detecting means for changing the voltage across said impedance proportionate to said variations, means for progressively storing electric energy derived from said impedance, grading means adapted to be set in accordance with said thickness grades, and electrical means controlled by said energy storing means for setting said grading means in accordance with said voltage changes.

3. A grading machine comprising two detecting means responsive to variations of thickness grades of two regions, respectively, of blanks of

stock passing therethrough, an impedance, electric selector means controlled by said detecting means for changing the voltage across said impedance proportionate to variations of said grades as affecting either of said detecting means, said selector means including means for rendering the selector means effective only for changing said voltage proportionate to unidirectional variations of said grades, grading means adapted to be set in accordance with said thickness grades, and electrical means controlled by said impedance for setting said grading means in accordance with said voltage changes.

4. A grading machine comprising detecting means responsive to variations of thickness grades of blanks of stock, an impedance, electric selector means controlled by said detecting means for changing the voltage across said impedance proportionate to changes of said thickness grades, means for rendering said selector means effective only with regard to increases of said voltage, responsive to decreases of said thickness grades, grading means adapted to be set in accordance with said grades, and electrical means controlled by said impedance for setting said grading means in accordance with said voltage increases.

5. A grading machine comprising two detecting means responsive to variations of thickness grades of two regions, respectively, of blanks of stock passing therethrough, an impedance, electric selector means controlled by said detecting means for changing the voltage across said impedance proportionate to changes of said thickness grades as affecting either of said detecting means, means for rendering said selector means effective only with regard to increases of said voltage, responsive to decreases of said thickness grades, grading means adapted to be set in accordance with said grades, and electrical means controlled by said impedance for setting said grading means in accordance with said voltage increases.

6. A grading machine comprising detecting means responsive to variations of thickness grades of blanks of stock, means for passing said stock through said detecting means, electric means including an impedance controlled by said detecting means for changing the voltage across said impedance proportionate to said variations, means for progressively storing electric energy derived from said impedance, grading means adapted to be set in accordance with said thickness grades, electrical transmitting means controlled by said energy storing means for setting said grading means in accordance with said voltage variations, and electrical means actuated by said passing stock for controlling the effectiveness of said transmitting means.

7. A grading machine comprising detecting means to measure thickness grades of blanks of stock moved relatively thereto, grading means adapted to be set in accordance with said thickness grades, means for supplying a substantially constant potential difference, an impedance connected across said potential supply means, means for storing electrical energy connected to said impedance, means controlled by said detecting means for varying the potential drop of said impedance and the energy of said storing means with varying grades of said stock, and electric means connected to said energy storing means for setting said grading means in accordance with the amount of stored energy.

8. A grading machine comprising detecting means to measure thickness grades of blanks of stock moved relatively thereto, grading means adapted to be set in accordance with said thickness grades, means for supplying a substantially constant potential difference, an impedance connected across said potential supply means, a condenser connected across a portion of said impedance, means controlled by said detecting means for increasing the potential drop of said portion and the charge of said condenser with decreasing grades of said stock, and electric means connected to said condenser for setting said grading means in accordance with said charge.

9. A grading machine comprising detecting means to measure thickness grades of blanks of stock, grading means adapted to be set in accordance with said thickness grades, means for supplying a substantially constant potential difference, an impedance coil having an intermediate tap point connected across said potential supply means, a condenser connected to said tap point, an inductance control means arranged to be moved relatively to said coil by said detecting means thereby changing the potential level of said tap point and hence the potential on said condenser, and electric means connected to said condenser for setting said grading means in accordance with said potential.

10. A grading machine comprising detecting means to measure the thickness grades of blanks of stock moved relatively thereto, grading means adapted to be set in accordance with said thickness grades, means for supplying a substantially constant potential difference, an impedance connected across said potential supply means, a condenser connected across a portion of said impedance, a unidirectional conductor connected in series with said condenser, means controlled by said detecting means for increasing the potential drop of said portion with decreasing grades of said stock, and electric means connected to said condenser for setting said grading means in accordance with the charge of said condenser and hence only with decreasing grades of said stock.

11. A grading machine comprising detecting means to measure the thickness grades of blanks of stock moved relatively thereto, grading means adapted to be set in accordance with said thickness grades, means for supplying a potential difference, an impedance coil having an intermediate tap point connected across said potential supply means, a condenser connected to said tap point, a unidirectional conductor connected in series with said condenser, a core arranged to be moved within said coil by said detecting means thereby changing the potential level of said tap point and hence the potential on said condenser, electronic amplifying means having a control electrode connected to said condenser for regulating the current flow therethrough, and means for setting said grading means in accordance with said current flow.

12. In a grading machine wherein means for grading articles are adjusted in accordance with thickness changes of articles detected by measuring means in terms of variations of an electrical value which variations are applied to said grading means, an electrical link for transmitting said variations from said measuring means to said grading means, and electric selecting means associated with said link for unidirectionally applying said variations of said values to said grading means proportionate to consecutively extreme values of said changes.

13. In a grading machine wherein means for grading articles are adjusted in accordance with thickness changes of articles detected by measuring means in terms of variations of an electrical value which variations are applied to said grading means, an electrical link for unidirectionally transmitting said variations from said measuring means to said grading means, and electric selecting means associated with said link for setting said grading means proportionate to consecutively extreme values of said variations and hence of said changes.

14. In a grading machine wherein means for grading articles are adjusted in accordance with thickness changes of articles detected by measuring means in terms of variations of an electrical value which variations are applied to said grading means, an electrical link for transmitting said variations from said measuring means to said grading means, and electric selecting means associated with said link for applying said variations of said values to said grading means proportionate to consecutively extreme values of said changes.

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