G. H. BLAXTER.

AUTOMATIC ADJUSTING MECHANISM FOR REELERS FOR TUBES, &c.

APPLICATION FILED OCT. 10, 1911.

1,059,821.

Patented Apr. 22, 1913.

3 SHEETS—SHEET 1.

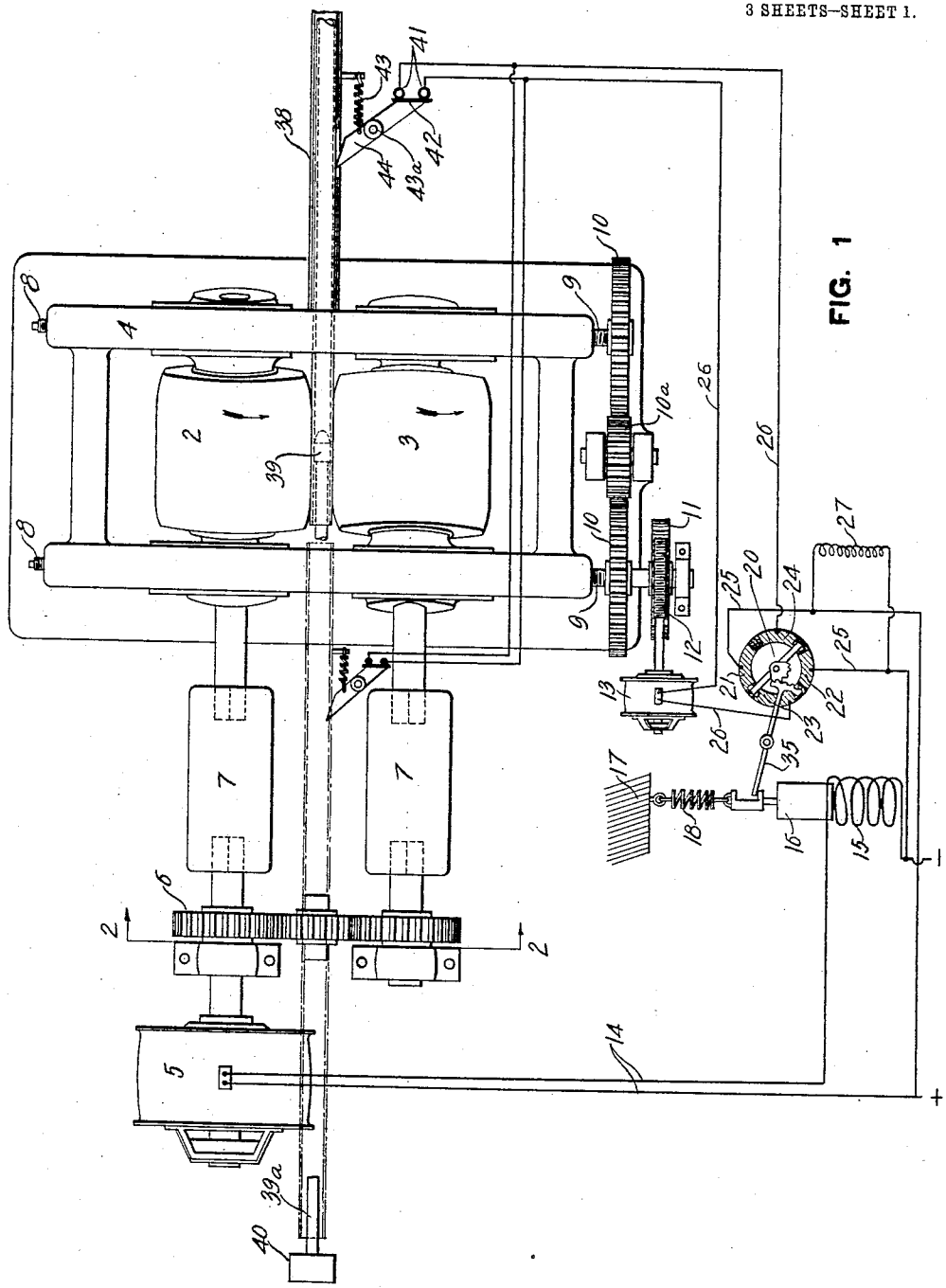

FIG. 1

WITNESSES

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3 SHEETS—SHEET 2.

FIG. 5

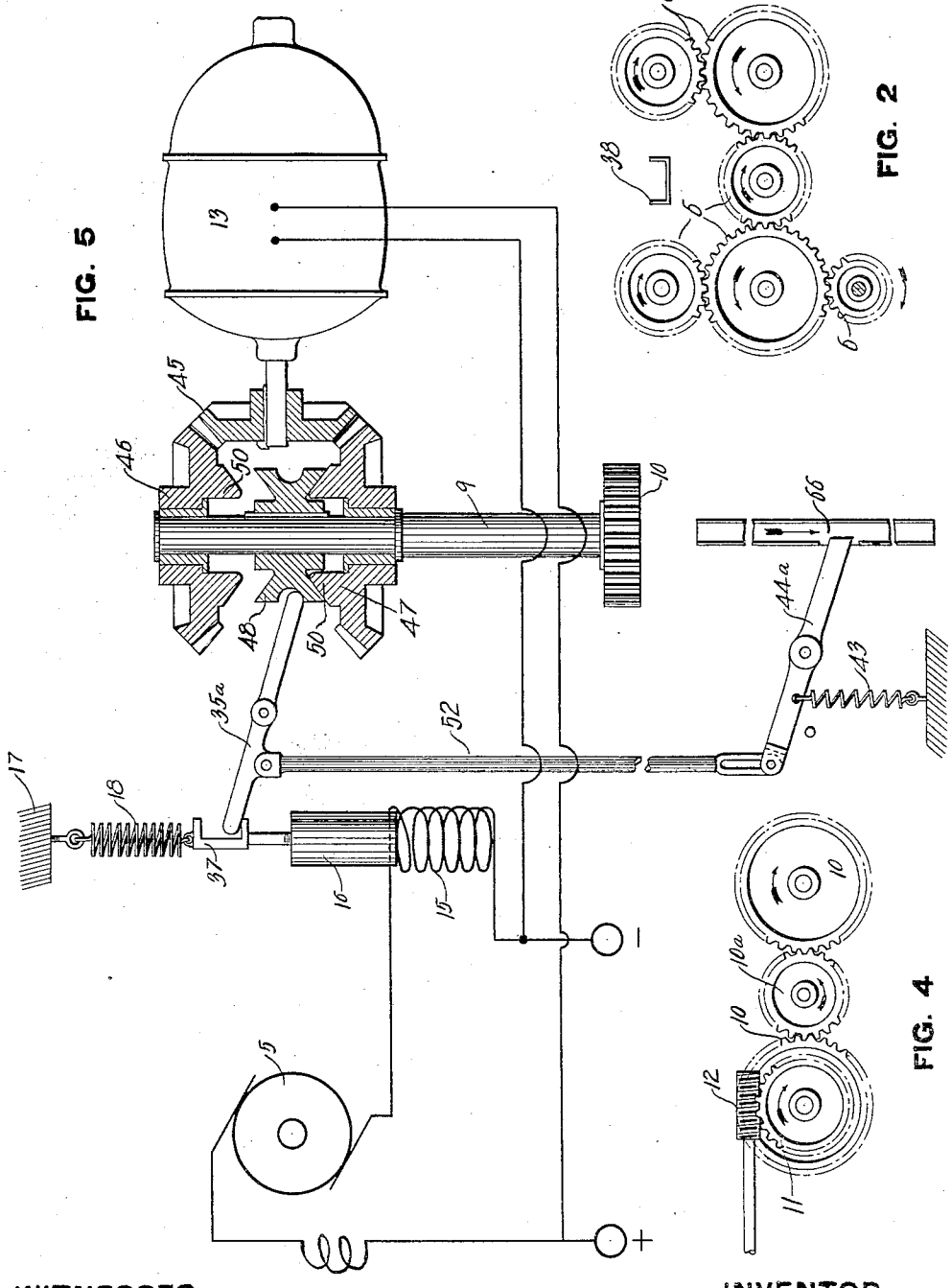

FIG. 2

FIG. 4

WITNESSES

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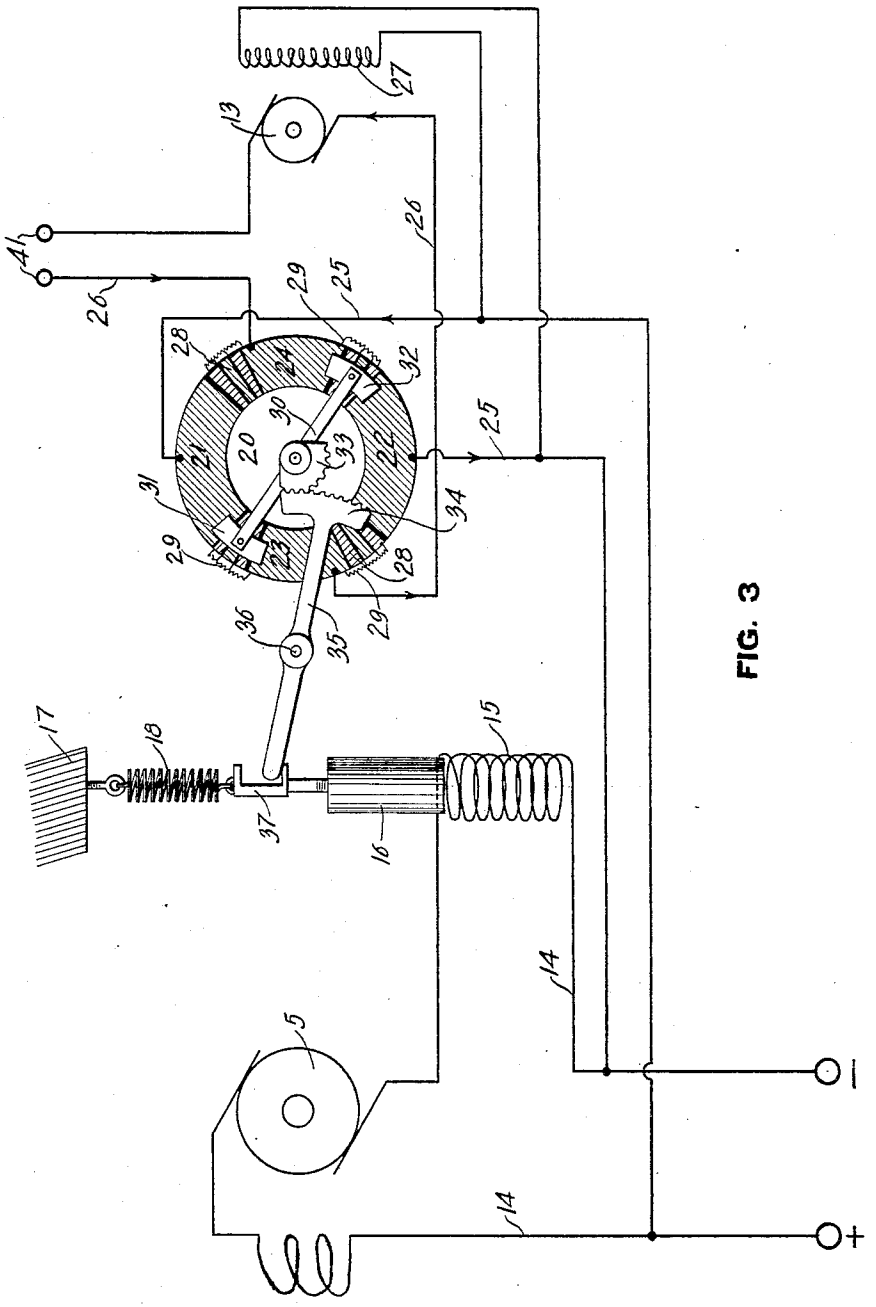

FIG. 3

WITNESSES

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AUTOMATIC ADJUSTING MECHANISM FOR REELERS FOR TUBES, &c.

1,059,821. Specification of Letters Patent. Patented Apr. 22, 1913.

Application filed October 10, 1911. Serial No. 653,843.

To all whom it may concern:

Be it known that I, GEORGE H. BLAXTER, a resident of Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Automatic Adjusting Mechanism for Reelers for Tubes, &c., of which the following is a specification.

This invention relates particularly to automatic control mechanism for adjusting the rolls of tube reelers, although such control mechanism may be adapted for adjusting machines of various kinds.

The object of the invention is to provide mechanism whereby tubes can be reeled to a uniform diameter and in a manner to reduce labor and attention on the part of the workman.

In the manufacture of seamless tubing, the hollow blank or tube as it leaves the rolling mill varies considerably in diameter, the walls vary in thickness, and the tube is more or less rough, both exteriorly and interiorily. When such tube or blank is reeled in the ordinary way it results in a tube of varying diameter due to the rolls performing different amounts of work on the walls of the tube at different points along the length thereof, and this in turn is due to the inequalities in the wall thickness of the rough tube. The reeling is generally done over a plug and consequently the thicker portions of the tube walls in being reduced to the desired gage expand to a greater extent than the thinner portions. Inequalities in the diameter of the product is, of course, objectionable.

The present invention provides apparatus for reeling tubes over a mandrel in which the inequalities in wall thicknesses is substantially reduced, the irregularities of the inner and outer surfaces substantially removed, and the tube given the necessary finish, and at the same time producing a tube of uniform diameter. This is accomplished without the addition of extra labor and without any particular attention being given thereto by the workman.

In the accompanying drawings Figure 1 is a general view partly diagrammatic of the apparatus; Fig. 2 is a vertical section on the line 2—2, Fig. 1; Fig. 3 is a diagrammatic view of the driving and control mechanism; Fig. 4 is a detail view of the adjusting mechanism; and Fig. 5 is a view partly diagrammatic showing a modification of the control mechanism.

The reeler may be of any desired type. That shown comprises a pair of barrel shaped rolls 2 and 3 mounted in a suitable frame or housing 4 and driven from an electric motor 5 which is connected to the roll necks by suitable intermediate gears 6 and flexible connectors or wabblers 7, or by any other suitable connecting means now well known in the art. The tube is guided between the rolls by the usual trough or guides 38. Between the rolls is the usual mandrel head or plug 39 held by the usual mandrel bar 39ª and back rest 40.

Either or both of the rolls may be mounted for adjustment during the reeling operation, but as shown in the drawing the roll 2 is adjustable by set screws 8 adapted to be manipulated by hand and not intended to be operated during the reeling operation. The roll 3 is adjustable during the reeling operation and to this end adjusting screws 9 bear against the journal boxes of the roll and at their outer ends are connected to rotate in unison by gears 10 and idler 10ª. When the rolls are acting upon the relatively thick portions of the tube walls the amount of current consumed is considerable, but when the rolls are acting upon the relatively thin portions of the tube walls the amount of current consumed by the main motor is less. I take advantage of this to effect the regulation of the adjustment, the parts being so arranged that when the current consumed rises the adjusting screws 9 of roll 3 are slacked off, and when the current consumed by the main motor decreases the screws 9 are set up to reduce the roll pass. This may be effected in various ways, but as shown there is placed in the mains 14 of the motor 5 a solenoid or other magnet 15 provided with a core or other armature 16 which is connected to a fixed support 17 by means of a spring 18 so arranged that when no current is flowing through the solenoid 15, or when the motor 5 is running under light load, the core 16 is drawn out of the solenoid. As the current to the motor 5 increases the solenoid core 16 is drawn into the solenoid to an extent depending upon the amount of current being used, and as the latter varies directly with the load

on the motor or the amount of reduction being effected by the reeler, it is obvious that the solenoid core can be utilized as a means for regulating the adjustment of the rolls.

The connection between the solenoid core 16 and the roll adjusting means can vary within wide limits. Figs. 1 and 3 show the adjustment by means of the small reversing electric motor 13 for actuating a worm 12 engaging a worm wheel 11 on one of the adjusting screws 9, and a reversing and controlling switch for motor 13 which is operated by the solenoid core. This switch is indicated at 20 and as shown comprises two pair of oppositely arranged segments 21 and 22 and 23 and 24. The segments 21 and 22 are connected to branches 25 from the mains 14, while the segments 23 and 24 are connected by wires 26 to the brushes of the motor 13. The field 27 of motor 13 is in a shunt from the leads 25.

The various segments of the switch are separated by insulated sections 28 shunted by starting resistance coils 29. Coöperating with the segments 21, 22, 23 and 24 is a switch member comprising a cross arm 30 carrying on each of its ends a contact member, marked respectively 31 and 32. These contacts are suitably mounted upon the arm 30 to be insulated therefrom and from each other or, if preferred, the arm 30 may be made of fiber or other insulating material. Secured to the axis of the cross arm 30 is a gear segment 33 meshing with a similar segment 34 on one end of lever 35 pivoted at 36 and whose opposite end extends within a yoke 37 secured to the solenoid core 16. It is obvious that the movement of the solenoid core 16 through the connection recited imparts oscillatory movement to the cross arm 30 and therefore carries the contacts 31 and 32 to different positions.

In the position of the starting and reversing switch shown in Fig. 3 segment 21 is electrically connected with segment 23 and segment 22 is electrically connected with segment 24. Consequently the current passes by the wires 25 to the motor 13 in the direction indicated by the arrow heads, thereby driving the motor 13 in the proper direction to cause the rolls of the reeler to approach more closely together. This is the condition when the load on the motor 5 is light and a relatively small amount of current is being consumed. This condition occurs when the rolls are acting upon a relatively thin-walled part of the tube. When, however, a portion of the tube with thicker walls enters between the rolls and the mandrel, the load on the motor 5 increases and more current therefore flows through solenoid 15. This draws the core 16 inwardly and oscillates the switch arm 30 so as to bring the contact members 31 and 32 upon the oppositely arranged segments 21 and 22, which breaks the connection to the adjusting motor 13. Should the load continue to increase the core 16 is drawn still farther into the solenoid, thereby imparting still further movement to the switch cross arm 30 until the contact members 31 and 32 are brought in such position that they connect segment 21 with segment 24 and segment 22 with segment 23. This again establishes connection to the motor 13 but the current flows in a direction opposite to the arrows, so that said motor 13 is reversed and the adjusting means of the reeler rolls is slacked off. As soon, however, as the excessively thick portion of the tube walls has passed the reeler, the current flowing through the solenoid decreases and spring 18 partly withdraws the core from the solenoid, thereby oscillating the switch cross arm 30 in the opposite direction and again bringing the contact members 31 and 32 onto the segments 21 and 22, which breaks the connection to the motor 13. Should the amount of work on the tube continue to decrease the spring continues to withdraw the solenoid core and the switch arm is oscillated backwardly until it again connects the segments of the switch in the position shown in Fig. 3, to again actuate the motor 13 in a direction to set up the adjusting screws.

It will thus be observed that by the means described the rolls of the reeler are adjusted toward and from each other according to the variation in the walls of the tube passing between the rolls and that this is effected entirely automatically, being controlled by the load on the motor which drives said rolls.

When no work is passing between the rolls it is necessary to stop the motor 13, as otherwise it would continue to run in the direction to entirely close the rolls 2 and 3. This is effected by a mechanical circuit closer 42 controlling contacts 41 in one of the conductors 26 to the motor 13, said circuit closer being arranged to be actuated by the tube passing through the reeler. As shown, the circuit closer is carried on an arm 44 pivoted at 43^a and having one end projecting into the path of the tube passing through the reeler, said tube acting to swing the arm and close the circuit at 41, but as soon as the rear end of the tube has passed the spring 43 swings the arm 44 in the opposite direction and again opens the circuit at 41. Consequently the motor 13 is idle during the period that the rolls are doing no work, and this prevents the adjusting screws being continuously turned in the direction to close the rolls. A circuit closing device 42 is located at both the entrance and the exit sides of the reeler in order to keep the motor 13 in operative condition as long as any part of the tube is in the reeler.

Fig. 5 illustrates a modification wherein

the small motor 13 for operating the adjusting screws 9 runs continuously in the same direction, with the addition of a reversing clutch controlled from the solenoid core 16. As shown, the armature shaft of motor 13 has secured thereto a bevel gear 45 meshing with a pair of reversely arranged bevel gears 46 and 47 both loosely mounted on the end of screw 9. Keyed to the screw 9 between the gears 46 and 47 is a friction clutch 48 having its opposite side faces arranged to coöperate with friction faces 50 on the gears 46 and 47. The clutch 48 is moved into contact with either one of said gears by means of a lever 35ª which is controlled from the solenoid core 16. By this arrangement the adjusting screw 9 is driven either forwardly or rearwardly, or remains stationary, depending upon the position of the clutch 48, and this in turn depends upon the amount of current flowing through solenoid 15. When the clutch is in neutral position the adjusting screws are stationary, while when the clutch is in the position shown in Fig. 5 the screws are rotated in such direction as to bring the rolls of the reeler closer together, and when the clutch 48 is in engagement with the gear 46 the screws are rotated in the reverse direction to slack off the rolls. When no work is passing through the rolls the clutch 48 is moved to neutral position by means of a rod 52 connected at one end to lever 35ª and at the other end to a lever 44ª projecting into the path of the tube in a similar manner to the switch arm 44 shown in Fig. 1.

In the use of the apparatus described, as long as the material entering the rolls is uniform the switch arm 30 remains in position with the contact members 31 and 32 resting on segments 21 and 22, in which position the motor 13 is at rest and produces no change in the adjustment of the rolls. When, however, the product entering the rolls is relatively small so that the power necessary to reduce it is decreased, the amount of current consumed by the main motor 5, drops, thereby permitting the spring 18 to partly withdraw the core 16 from solenoid 15 and cause the arm 30 to move to such position as to connect segment 21 with segment 23 and segment 22 with segment 24, thereby driving the motor 13 in such direction as to set the rolls more closely together. If, on the contrary, the reduction of the product becomes more difficult the greater current flowing through the main motor 5 draws the solenoid core 16 inwardly to such an extent as to move the contact members 31 and 32 into position to connect respectively segments 21 and 24 and segments 22 and 23, in which position the current through the motor 13 is reversed and the adjusting screws are turned in a direction to open up the rolls. As a consequence the rolls are automatically adjusted by the load on the motor 5, and this tends to equalize the power consumed in the action of the rolls on successive portions of the tube. This effect is secured entirely automatically and requires no attention on the part of the attendant. The machine is doing substantially a uniform amount of work at all times and there is practically no danger of stalling the machine.

The control mechanism described can be used for adjusting the working element of various kinds of machines but is particularly adapted for rolling or reeling tubes over a mandrel or plug. As illustrated in the drawings. The control mechanism can also be used as a safety device against serious overloads on rolls or machines of various types.

What I claim is:—

1. Apparatus comprising in combination, rolls and a mandrel therebetween, driving means for said rolls, adjusting means for said rolls, and electrical means controlled by variations in the power consumed by the roll driving means for controlling and actuating said roll adjusting means and reversing the same.

2. Apparatus comprising in combination, rolls and a mandrel therebetween, driving means for said rolls, adjusting means for said rolls, an electric motor for actuating said adjusting means, and means controlled by variations in the power consumed by the roll driving means for controlling and reversing the action of the adjusting motor on the roll adjusting means.

3. Apparatus comprising in combination rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, an electric motor for controlling the roll adjusting means, a magnet in the main driving circuit, and means actuated by said magnet for controlling and reversing the action of the adjusting motor on the roll adjusting means.

4. Apparatus comprising in combination, rolls and a mandrel therebetween, electrical roll driving means, roll adjusting means, an electric motor for actuating said roll adjusting means, a magnet in the main driving circuit, and means actuated from said magnet for controlling the action of the motor on the roll adjusting means, said means having a neutral and reverse active positions.

5. Apparatus comprising in combination, rolls and a mandrel therebetween, electrical driving means for the rolls, adjusting means for the rolls, a magnet in the main driving circuit, a reversible electric motor for controlling the roll adjusting means, and means actuated by said magnet for controlling and reversing said motor.

6. Apparatus comprising in combination, rolls and a mandrel therebetween, electrical

roll driving means, roll adjusting means, an electric motor for actuating said roll adjusting means, a magnet in the main driving circuit, and connections between said magnet and the adjusting motor, said connections including a reversing switch.

7. Apparatus comprising in combination, rolls and a mandrel therebetween, electrical roll driving means, roll adjusting means, an electric motor for actuating said adjusting means, a solenoid in the main driving circuit, a core therefor, means arranged to draw said core out of said solenoid, and means actuated by said core for controlling and reversing the action of the adjusting motor on the adjusting means.

8. Apparatus comprising in combination, rollers and a mandrel therebetween, electrical roll driving means, roll adjusting means, an electric motor for actuating said adjusting means, a solenoid in the main driving circuit, a core therefor, means arranged to draw said core out of said solenoid, and a reversing switch in the adjusting motor circuit actuated from said solenoid core.

9. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, adjusting means therefor, an electric motor for operating said working element, a magnet in circuit with the motor, an electric motor for operating the adjusting means, and connections between the circuit of the main and said second motor whereby said adjusting motor is controlled by the current flowing in the main motor circuit.

10. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, adjusting means therefor, an electric motor for actuating said adjusting means, and electrical connections between the main motor circuit and said secondary motor whereby the current flowing in the main motor circuit controls said secondary motor, said connecting means including a reversing switch.

11. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, an electric motor operating the same, adjusting means for said working element, an electric motor actuating said adjusting means, a magnet in the main motor circuit, and a controlling switch in the secondary motor circuit and actuated from said magnet.

12. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, an electric motor for operating the same, adjusting means for said working element, a secondary electric motor for actuating said adjusting means, a solenoid in the main motor circuit, a core therefor, a spring acting on said core in opposition to the solenoid coil, a controlling switch in the circuit of the secondary motor, and connections between said solenoid core and said switch for actuating the latter.

13. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, adjusting means for said working element, an electric motor operating said working element, a magnet in circuit with said motor, an oscillating member actuated by said magnet, and a controlling and reversing switch in the circuit of the secondary motor actuated from said oscillating element.

14. Automatic regulating means for electrically driven machines comprising in combination, the working element of the machine, an electric motor operating the same, adjusting means for said working element, an electric motor for actuating said adjusting means, a magnet in circuit with the main motor, a control and reversing switch in circuit with the secondary motor, connections from said magnet for actuating said switch, and a mechanically operated switch in the circuit of said secondary motor.

In testimony whereof, I have hereunto set my hand.

GEORGE H. BLAXTER.

Witnesses:
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MARY E. CAHOON.