Dec. 12, 1933. J. YOUNG 1,939,427

AUTOMATIC CURRENT REGULATOR FOR ELECTRIC ARC FURNACES

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FIG. 1.

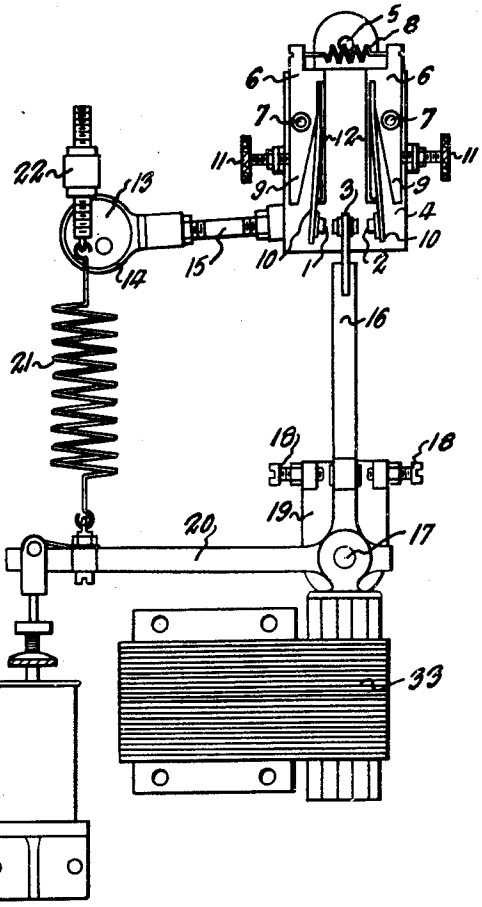
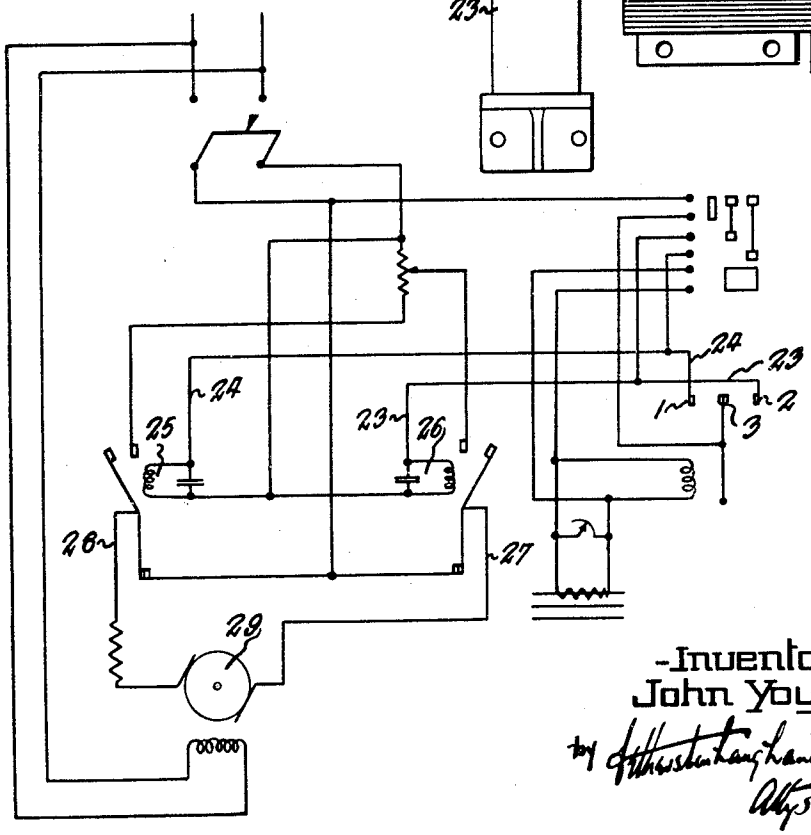


FIG. 2.



-Inventor-
John Young
by Fitzsimmons and Hand Tansley
Attys.

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AUTOMATIC CURRENT REGULATOR FOR ELECTRIC ARC FURNACES

John Young, Welland, Ontario, Canada

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3 Claims. (Cl. 200—111)

My invention relates to improvements in the automatic control of the arc in electric arc furnaces and the like, and the object of my invention is to provide a means for adjusting the position of the electrode in accordance with the fluctuations of the current passing into the furnace.

A further and particular object of my invention is to produce a device in which intermittent making and breaking of electrical control circuits is obtained, whereby such device gives a step by step motion of various lengths of duration, depending upon the fluctuations in current passing into the furnace.

My invention consists of the preferred embodiment of my device constructed and arranged all as hereinafter more particularly described and illustrated in the accompanying drawing in which:—

Fig. 1 is a front elevational view of my controlling device, and

Fig. 2 is a circuit diagram showing the connections between my device and the furnace.

Like characters of reference indicate corresponding parts in the two views in the drawing.

My device as illustrated in Fig. 1 comprises two main parts, one constituting a pair of electrical contact points 1 and 2 to which a rhythmical pulsation is imparted, and the second a contact point 3 positioned to make contact with either of the points 1 and 2 and capable of being varied in its relation to the points 1 and 2 by fluctuations in the electrical current so that contacts of varying durations are obtained.

For imparting a pulsation movement to the contact points 1 and 2 a swinging member 4 is furnished being pivotally mounted at the point 5. The member 4 carries a pair of blocks 6 of insulating material pivotally mounted upon pins 7 and connected together by a spring 8. The inner faces 9 of the blocks are inclined and carry strip springs 10 upon the outer ends of which the contact points 1 and 2 are carried.

Adjusting screws 11 are furnished upon the sides of the member 4 and bear against the blocks whereby such blocks can be adjusted under the influence of the spring 8 to vary the distance between the points 1 and 2. To retain the strip springs 10 from moving towards each other under their own resiliency I provide stop pieces 12 which are carried upon the blocks and against the outer ends of which the strip springs bear.

To impart the pulsation movement to the member 4 I provide an eccentric 13 which is rotated continuously by a motor or from any other source of power and the eccentric strap 14 is connected to the member 4 by a connecting rod 15.

The contact point 3 which of course is double faced so that it may make contact with the points 1 and 2 between which it is positioned, is carried upon the end of a vertical arm 16, such arm being pivoted at its lower end upon a pin 17. Below the arm 16 I furnish a solenoid assembly 33 which can be energized from a current transformer or other means of current supply and which swings the arm 16 to and fro in accordance with the current fluctuations passing through the solenoid, the degree of swing of the arm 16 being governed by a pair of adjusting screws 18 which are carried upon a back plate 19, the inner ends of the screws constituting stops for the arm movement.

Extending from the lower end of the arm 16 in the vicinity of its pivotal pin I furnish a substantially horizontal beam 20 which swings in unison with the arm 16 and balanced at its outer end by a spring 21 which depends from an adjustable support 22. The outer end of the beam is also connected to a dash pot 23 which acts as a damper in the movement of the beam 20.

When the device is in operation the member 4 has a continuous rhythmic pulsation under the influence of the rotating eccentric 13 as have also the contact points 1 and 2 carried by such member. The latter being so adjusted that when the arm 16 is in its central position no contact is made between the contacts 1 and 3 or 2 and 3.

Should there be a fluctuation in the current passing through the solenoid 33 the arm 16 will be made to deflect to one side or the other, and if the movement is sufficient contact will be made with either of the contacts 1 or 2 dependent upon the side to which the arm 16 deflects. Referring now to Fig. 2, it will be seen that when this occurs either of the circuits 23 or 24 will be closed and as such circuits include the magnetically actuated switches 25 and 26 the particular magnetic switch which is energized will close, thus closing one of the two circuits 27 and 28 to the armature of the electrode winch motor 29, whereby the actuation of the motor will raise or lower the electrode in the furnace dependent upon its direction of rotation.

It will be observed that the duration of contact between the points 1 and 3 and 2 and 3, at every pulsation of the member 4 depends upon the degree of deflection of the arm 16, the greater the current fluctuation in the solenoid 33, the longer will be the contact. The provision of the adjusting screws 11 and 18 enable the pulsa-

tion paths of the points 1 and 2, and the degree of deflection of the contact point 3, to be finally adjusted so that any desired contact between the points 1 and 3 and 2 and 3 upon deflection of the arm 16 can be obtained. Thus, depending upon the deflection of the arm 16 I provide a series of contacts of varying duration which cause the electrode winch motor to rotate to lift or lower the electrode as the case may be, for periods in proportion to the lengths of such contacts.

From the foregoing description it will be apparent that I have produced a device for regulating the arc current flow in electrical arc furnaces in proportion to the degree of change of the current passing into the furnace through the utilization of a step by step motion or electrical contacts of various lengths of duration, and although I have shown and described a particular embodiment of my invention it is to be understood that I can make such changes and alterations as I may deem necessary from time to time without departing from the spirit of my invention as set forth in the appended claims.

What I claim as my invention is:

1. An electrode adjusting control switch for electric arc furnaces comprising a mechanically oscillated member, a pair of blocks pivotally mounted upon the oscillated member, means for adjusting the position of the blocks upon the oscillated member, a pair of resiliently mounted contact points each carried upon a block, and to each of which an electric circuit extends, a moveable electrical contact point mounted independently of the oscillated member and with which the oscillated contact points make intermittent contact, and solenoid means actuated by any fluctuations in its supplied current for moving the second electrical contact point in its relation to the paths of oscillation of either of the oscillated points.

2. An electrode adjusting control switch for electric arc furnaces comprising a mechanically oscillated member, a pair of blocks pivotally mounted upon the member in spaced apart relation, means for adjusting the distance between the blocks, a pair of resiliently mounted contact points each carried upon a block and facing towards each other and to each of which an electric circuit extends, a second moveable electric contact point mounted independently of the oscillated member between the oscillated contact points to make intermittent contact therewith, and solenoid means actuated by any fluctuations in its supplied current for moving the second electrical contact point in its relation to the paths of oscillation of either of the oscillated points.

3. An electrode adjusting control switch for electric arc furnaces comprising a mechanically oscillated member, a pair of wedge shaped blocks pivotally mounted upon the member in spaced apart relation, a pair of spring strips each carried in front of one of the inclined faces of a wedge block, a pair of contact points each carried upon the free end of one of the strips, and to each of which an electric circuit extends, means for adjusting the blocks in their spaced apart relation to one another, a pivotally mounted arm having one end extending between the contact points, a second contact point upon the end of the arm extending between the contact points, and solenoid means actuated by any fluctuations in its supplied current for moving the arm and its contact point in relation to the paths of oscillation of either of the oscillated points.

JOHN YOUNG.