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AUTOMATIC SPEED CONTROL OF MOTORS

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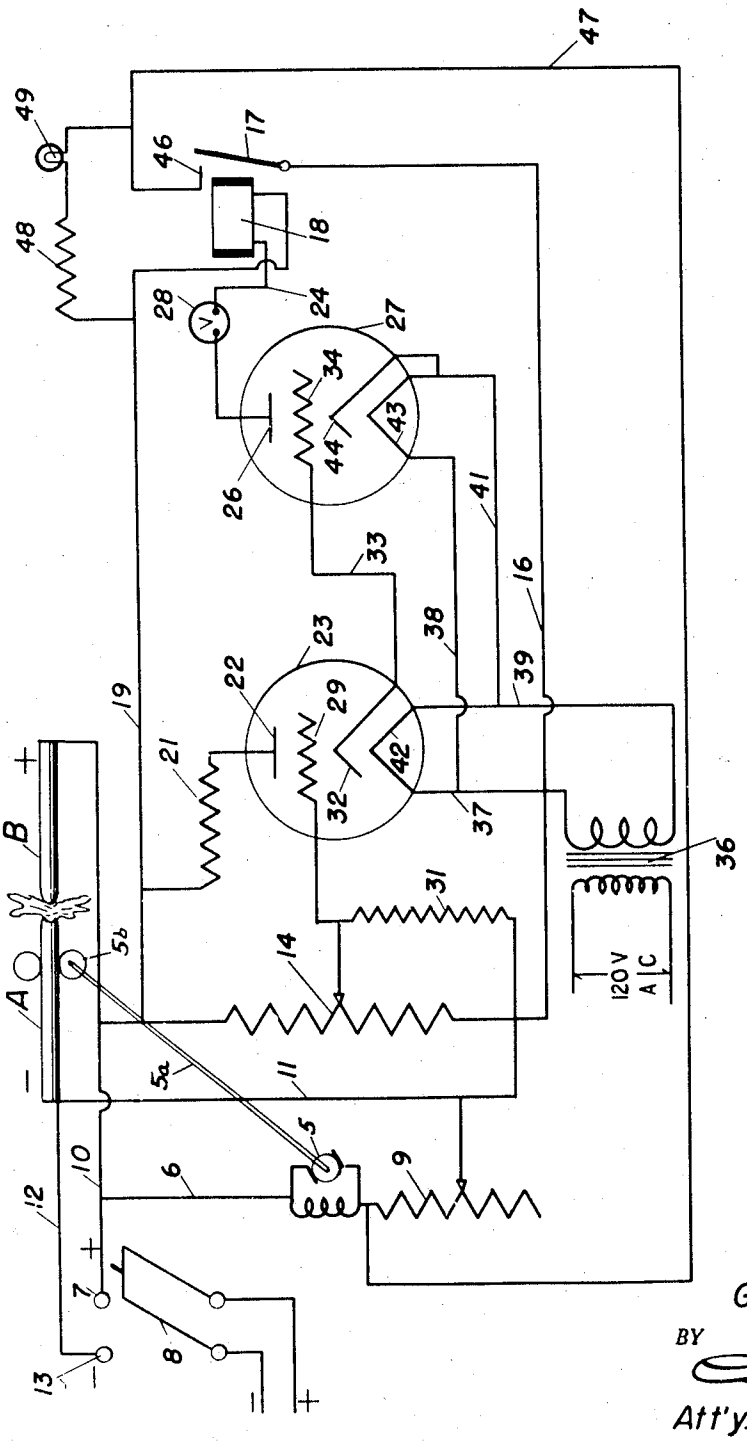

INVENTOR.
George W. Switzer

BY
C. L. Owens

Att'y.

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AUTOMATIC SPEED CONTROL OF MOTORS

George W. Switzer, Mill Valley, Calif., assignor of one-fourth to Abe Blumenfeld and one-fourth to Hal D. Neides

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1 Claim. (Cl. 318—333)

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This invention relates to an apparatus to regulate the speed of a motor drive so as to control the speed of the motor, irrespective of fluctuation of line voltage.

The principal object of this invention is to produce a device which may be attached to any standard motor circuit without altering its construction.

A further object is to provide means for instantaneously detecting any line voltage change and to automatically compensate therefor, so as to eliminate manual compensation.

A further object is to produce an apparatus which is economical to manufacture and install on present day equipment.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawing forming a part of this specification and in which like numerals are employed to designate like parts throughout the same the figure is a schematic wiring diagram of one use to which my invention can be placed.

There are many places where it is desirable to have a feed arrangement which will automatically compensate for different working conditions and for line voltage changes, as for instance, the feed of the arc lamp as used in motion picture projectors, or the feed of the electrodes of an automatic welding machine.

In motion picture projection machines it is necessary that the carbons be fed toward each other at such a rate that a predetermined gap between the abutting ends is maintained. This gap cannot vary more than one two-hundredths of an inch without affecting the screen illumination.

It has heretofore been necessary for the operator to watch the arc and to manually adjust the feed in order to compensate for voltage changes or changes in the characteristic of the carbons being consumed.

I have therefore perfected an apparatus which may be connected to any motor-feed mechanism in order to speed up or retard the motor and thereby compensate for any change in the line voltage.

The single view represents a diagrammatic wire diagram of the present invention.

In accomplishing my object I employ the usual motor 5, which is connected to one side of the line by wires 6 and 10, to the contact 7 of switch 8. The other side of the motor is connected through a variable resistance 9 and wires 11 and 12 to contact 13 of switch 8.

We will now assume that the motor 5 is to

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control the feed of an arc lamp, having a positive carbon and a negative carbon, which have to be fed toward each other as they are consumed by means of a shaft 5a on which is carried a friction wheel 5b engaging the carbon A to move the same toward and from the carbon B as shown in general in the patent to Kennedy, #2,145,010, and at such a speed that the gap between the adjacent ends of the carbons will not vary more than two one-hundredths of an inch from a predetermined setting, irrespective of the hardness or softness of the carbons, or of hard or soft spots in the carbons, which will affect the rate of consumption of the carbons.

The wire 11 is connected to the carbon "A," which is the negative carbon, and the positive carbon "B" is connected to the positive wire 10.

In order to detect and control the speed of the motor 5 I employ one or more electronic tubes and in the present showing I have used two tubes and a relay, which tubes and relay are connected to the circuit above described, as follows: The positive wire 10 is connected to a variable resistance 14, the opposite end of which is connected by a wire 16 to the armature 17, of the relay 18.

The positive wire 10 is also connected by wire 19 to one side of the relay 18 and also through a resistance 21 to the plate of the tube 23. The opposite side of the relay 18 is connected by wire 24 to the plate 26 of the tube 27.

Inserted in the wire 24 is a milliammeter 28.

The variable contact of the resistance 14 is connected to the grid 29 of the tube 23 and also to one end of a resistor 31, the opposite end of which is connected to the negative end of resistor 14 and to wire 11.

The cathode 32 of tube 23 is connected by wire 33 to the grid 34 of tube 27.

At 35 I have shown an A. C. transformer to furnish filament current through wires 37—38 and wires 39—41 to the filaments 42 and 43 in the tubes 23 and 27 respectively. The wire 37 is connected to the wire 11, through the wire 16, and thus places a negative bias on the cathode of the tube 27 as the cathode 44 is connected to the filament-lead 41.

The contact 46 of the relay 18 is connected by wire 47 to the motor 5. At 48 I have shown a resistance and lamp 49 connected in series between the wires 19 and 47, which lamp will indicate when the apparatus is in operation.

Assuming that the above has been connected to a motor circuit and, for a matter of discussion, to the motor circuit of an arc lamp feed;

also, that the line voltage is varying, the following will then occur:

If the voltage rises, the grid **29** will become more positive than it is at the present time, through the effect of the resistor **31**, and at normal voltage no current will be flowing from the cathode **32** to the plate **22**; but, as soon as the grid becomes positive, current can flow, thus causing the grid **34** of the tube **27** to become more positive, causing current to pass from cathode **44** to plate **26** and relay **18** to attract its armature **17**, completing a circuit from wire **16** to wire **47** and shorting out resistor **9**. This will speed up the motor to move the carbons "A" and "B" toward each other until the positive voltage on the grid **29** is lowered, at which time the negative bias will act to stop the flow of current through the tube **23**. This, in turn, will stop the flow of current in the tube **27** and relay **18** will open, causing the motor to slow down as the resistance **9** is again placed in the motor feed circuit.

The relay, therefore, acts to cut in and out the resistance **9** at a rate controlled by the action of the tubes controlled by voltage changes in the line. Inasmuch as the tubes are very sensitive to voltage variations the control of the motor is practically instantaneous for such an installation.

It will also be apparent that in welding, voltage changes take place due to poor contact variations in the resistance of the parts being welded, etc., and therefore this invention would control equally as well the speed of the driving motor of a welding machine.

It is to be understood that the form of my invention herewith shown and described is to be taken as a preferred example of the same and that various changes relative to the material, size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claim.

Having thus described my invention, I claim:

The combination in voltage controlling means, of a motor, a current supply having negative and positive sides, a current consuming apparatus having an adjustable element, a conductive connection between one side of said supply and one terminal of said apparatus, a mechanical connection between said motor and said apparatus for adjustment of the latter, a resistance connected to one terminal of said motor, a conductive connection between said side of the current supply and the resistance, a conductive connection extending from the second side of said current supply and connected to the remaining termini of the apparatus and motor in multiple, a normally open relay having a fixed contact and a movable contact, a conductive connection between one of said contacts and the motor and having connection with the motor between the first mentioned motor terminal and said resistance, a conductive connection between the last mentioned terminus of said apparatus and the remaining relay contact, said relay including a magnet operable when energized to close said contacts, a conductive connection between the second side of the current supply and one terminus of the magnet, a tetrode, a conductive connection between the plate of said tetrode and the remaining terminus of said magnet, a second tetrode, a conductive connection between the grid of the first tetrode and the cathode of the second tetrode, a conductive connection including a resistance and connecting the plate of the second tetrode with the connection to the first mentioned terminal of the magnet, and a conductive connection including a resistance and connecting the grid of the second tetrode to the first mentioned resistance.

GEORGE W. SWITZER.

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