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ELECTRIC CURRENT REGULATOR WITH PRESSURE LOADED CARBON-PILE COLUMN

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Fig. 1.

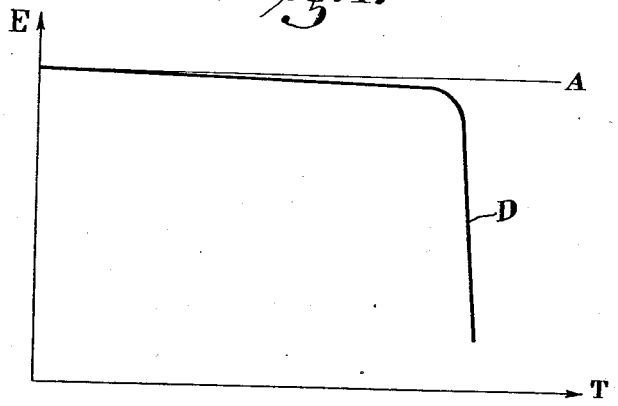
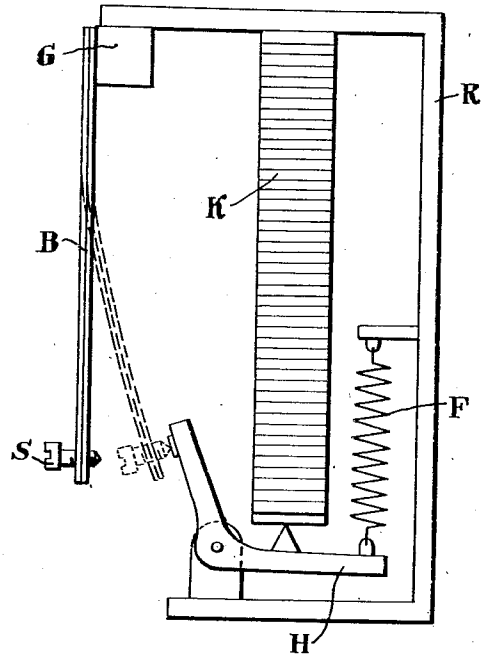


Fig. 2.



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ELECTRIC CURRENT REGULATOR WITH PRESSURE LOADED CARBON-PILE COLUMN

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3 Claims. (Cl. 201—51)

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This invention relates to a regulating arrangement for electrical circuits and particularly for controlling the output of a generator by changing its field current.

An object of this invention is to provide a control arrangement for a generator wherein the control arrangement does not interfere with the normal operation of the generator throughout a wide range of operation, but when a predetermined load is reached, a slight increase in the output characteristics of the generator will cause a marked increase in the regulating effect. A further object is to provide apparatus of the above character wherein the output potential of the generator is maintained constant throughout the normal range of its output, but at the upper load limit, the potential drops suddenly. These and other objects will be in part obvious and in part pointed out below.

In the drawing in which is represented one embodiment of the invention:

Figure 1 is a curve representing the operation of the device; and

Figure 2 is a partially schematic showing of the control unit.

Referring particularly to Figure 1 of the drawing, the curve A represents a constant potential line and shows a constant potential E, while the load varies along the abscissa. The curve D represents the output potential of a generator controlled in accordance with the present invention as the load of the generator varies between no load and maximum load. As shown by curve D, the potential remains substantially constant throughout the range of the normal load, but at the upper limit of the load, there is a sudden drop in the potential. In this manner the operation of the generator is closely controlled, with the result that there will be no overloading of the generator.

Referring particularly to Figure 2 of the drawing, wherein an illustrative embodiment of the control unit is shown somewhat schematically, a frame R provides a mounting for a carbon-pile K, with the carbon-pile having its fixed end attached to the top of the frame. At the bottom of the frame is mounted a bell crank H, the horizontal portion of which is held in engagement with the lower end of the carbon-pile by a spring F which has its upper end attached to the frame R. Spring F maintains sufficient pressure on the carbon-pile to hold the pile compressed. The other arm of the bell crank H extends upwardly and to the left, and mounted at the top of the frame and extending downwardly parallel to the carbon-

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pile so that its lower end may engage this arm of the bell crank is a bimetallic strip B. Bimetallic strip B has its upper end rigidly attached to a block G which is fixed to the frame, and as the temperature of the bimetallic strip rises, the strip curves and its lower end in effect swings through an arc and moves from the position shown in full lines toward the broken-line position. The lower end of the bimetallic strip carries an adjusting screw S, the end of which engages the bell crank H.

In this embodiment bimetallic strip B is positioned parallel to a hot wire heater (not shown) the temperature of which varies with the load. To obtain this effect, this hot wire heater carries the load current. The carbon-pile K is connected in parallel with a voltage regulating coil with the result that when the resistance of the carbon-pile is increased, there is a rapid increase in the current through the regulating coil, and this causes the regulating coil to become effective to reduce the output voltage of the generator. In the present embodiment the resistance of the carbon-pile remains constant throughout normal loads, but when the upper limit of the output is reached, this parallel unit becomes effective to reduce the generator voltage at a rapid rate. Accordingly, when the temperature of the bimetallic strip rises above the temperature corresponding to the broken-line position of the strip, the strip swings the bell crank H clockwise against the tension of spring F to thereby remove the pressure on carbon-pile K. The removing of pressure upon carbon-pile K gradually increases the resistance of the carbon-pile. As indicated above, the increase in the resistance of the carbon-pile causes a rapid decrease in the output potential of the generator, and this in turn prevents the generator output from exceeding the desirable upper limit.

While this control unit is effective to exert a substantial influence limiting the output of the generator, the control unit does not interfere with the operation of the generator when the generator load is below the safe value. This effect is obtained by providing the loose linkage connection between the end of the bimetallic strip and the bell crank H. The control unit may be adjusted to change the upper limit at which the control unit becomes effective by adjusting screw S. By adjusting the screw S, the temperature at which the bimetallic strip engages the bell crank is changed, and when the temperature of the bimetallic strip rises beyond the temperature corresponding to the adjustment, the resistance of

the carbon-pile K is raised, thereby lowering the generator voltage. However, when the generator load is below the value corresponding to this temperature, the control unit does not interfere with the normal operation of the generator.

In this way the potential of the generator follows the curve D in Figure 1, with the result that there is a definite maximum load limit but the potential is maintained substantially constant for all loads below this limit. It is thus seen that I have obtained the objects above set forth and that the control unit is effective to produce a broken load characteristic.

What I claim is:

1. A regulator for an electric current circuit comprising, a pressure loaded column of carbon discs, a bimetallic strip having a free end the position of which varies with changes in temperature of the strip, a lever unit having an arm the position of which is varied to change the pressure load on said column and having an arm which is engaged by said free end of the bimetallic strip at abnormally high temperatures, said bimetallic strip thereby being effective to reduce the pressure load on said column at said abnormally high temperatures, and an adjusting screw in said free end of the bimetallic strip to change the relationship between said free end and said lever with the result that the range of effective operation of said bimetallic strip is changed.

2. A regulator comprising, the combination of, a frame construction, a carbon-pile supported by said frame construction in such a manner that it may be compressed to thereby reduce the effective electrical resistance of the carbon-pile, a lever rockably mounted on said frame construction and adapted to engage the end of said carbon-pile, a coil spring carried at one end by said frame construction and having its other end engaging said lever to thereby force said lever against said carbon-pile, and a bi-metallic strip having a fixed end rigidly mounted on said frame construction and having a free end which moves into engagement with said lever and swings said lever away from said carbon-pile against the action of said spring when the temperature of said bimetallic strip goes beyond a predetermined value.

3. A regulator for a main electric circuit comprising, a carbon-pile connected in a control circuit and adapted to have its effective resistance varied by changing the pressure compressing the carbon-pile, mounting means providing support for said carbon-pile, a spring means mechanically connected to maintain a predetermined compressing force upon said carbon-pile, a thermo-responsive strip element mounted at one end in a position to be heated by the current flowing through said main electric circuit and having a free end which tends to take a position depending upon the temperature of the strip element which temperature in turn varies with the current flowing through said circuit, and means adapted when said free end moves toward one extreme of its range of movement to mechanically interrelate said free end of the thermo-responsive strip element and said spring means whereby said thermo-responsive strip element becomes effective to oppose the action of said spring means and to thereby change the compressive force being exerted on said carbon-pile.

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