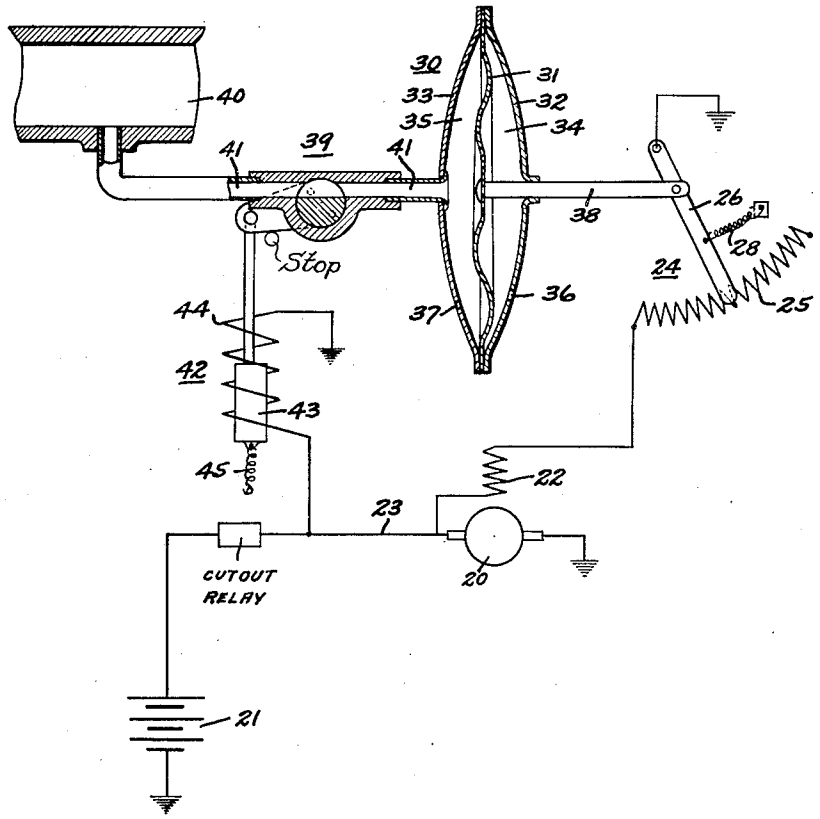
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REGULATING DEVICE

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REGULATING DEVICE

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This invention relates to improvements for regulating the voltage of a generator.

One object of the present invention is to provide a simple and efficient regulating device which will maintain the voltage of a generator substantially constant for the various speeds it may be driven.

Another object of the present invention is to connect a rheostat in the field circuit of a generator in such a manner that the rheostat will be automatically shifted from time to time according to slight variations of the voltage produced by the generator, thereby regulate the voltage output of the generator.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of one form of the present invention is clearly shown.

Referring to the drawing, the drawing is a diagrammatic illustration of one embodiment of the invention showing the electrical circuits, connections and devices which may be used in the present invention.

A generator 20 operated to supply current to a storage battery 21, is provided with a field winding 22, one end being connected with a lead wire 23, while the other end is connected to a rheostat or variable resistance 24. The rheostat comprises a resistance element 25 that is adapted to be cut into the field circuit and placed in series with or otherwise connected with the field winding 22. It is conceivable that the resistance element 25 may be connected in parallel with the field winding 22 though it has been illustrated only in series.

The resistance element 25 is controlled by a wiper or contact arm 26 that is automatically actuated in accordance with the suction produced within a suction chamber 30 by the operation of an engine. It is to be understood, however, that any fluid pressure means may be used that is responsive to engine operation to operate the arm 26 of the rheostat 24. A spring 28 attached to the arm 26 tends to move the arm in a contra-clockwise direction of rotation, so as to cut in the maximum resistance of the rheostat 24.

The suction chamber 30 is provided with a diaphragm 31 secured between two walls 32 and 33 in any suitable manner. The diaphragm divides the chamber 30 into two compartments 34 and 35. The wall 32 has an aperture 36 so as to reduce the resistance of diaphragm movement within the compartment 34. The wall 33 has a small opening 37 to allow gradual equalization of pressure within the chamber 30, and prevent the formations of extremely low pressure in the compartment 35. The diaphragm 31 has secured thereto a link 38, that in turn is connected to the arm 26. The arm 26 is so arranged that when the suction produced within the chamber 30 increases or decreases, it will be moved relative to the resistance element 25, in such a manner that a part of the arm 26 will wipe over the resistance element 25.

A valve 39 is interposed between the suction chamber 30 and an intake manifold 40 of an internal combustion engine, the valve 39 controlling a passage 41 from the intake manifold 40 to the suction chamber 30, and is in turn actuated by an electro-magnet 42 responsive to slight voltage changes. The electro-magnet 42 as illustrated, is provided with an armature 43 and a winding 44 of high resistance connected across the terminals of the generator 20.

The operation of the device is as follows: When the engine has been started it will create a suction within the manifold that is in turn communicated to the chamber 30 through the passage 41. This suction will cause the diaphragm 31 and the link 38 to move to the left as viewed in the drawing, which in turn will move the arm 26 in a clockwise direction to cut out a portion of the resistance of the rheostat 24. As the engine speed increases for part throttle, the suction will tend to increase within the chamber 30 through the passage 41 thereby moving the rheostat to decrease the resistance in the field 22 and increase the field excitations. This tendency to increase the excitation in the field 22 is accompanied by an increase in voltage by the generator sufficient to vary the energizations of the electro-magnet 42 that, in turn actuates the valve 39 in such manner as to more or less restrict the passage 41, thereby altering the suction pressure within the compartment 35, allowing the diaphragm to move to the right or left to its equilibrium position due to the tension of the spring 28. This operates to move the arm 26 of the rheostat 24 varying the resistance in the field circuit and thereby, through a reversal of foregoing operations, reacts upon the generator to keep its voltage within a definite range. The amount of resistance that is cut in principally varies with the speed of the engine, whereby the field circuit will be controlled so as to maintain a substantially constant voltage of the generator. This results in a regulatory func-

tion as will be observed from the following.

As long as the speed of the engine is sufficient to operate the generator to produce the required voltage for energizing the electro-magnet 42, the magnet will operate the valve 39 to vary the restriction of the passage 41, sufficiently to control the suction pressure for operating the diaphragm 31. The regulation of the diaphragm actuates the rheostat to keep the voltage of the generator substantially constant in that as soon as the voltage of the generator decreases sufficiently to decrease the magnetic effect of the electro-magnet 42, the valve 39 will open wider due to the tension of a spring 45 attached to the armature 43 of the electro-magnet 42. As the valve opens, a greater suction pressure is produced within the compartment 35 that decreases resistance in the field 22 thus building up the voltage of the generator, and on the other hand, when a slight increase of generator voltage occurs, the elements react upon one another to increase the resistance of the field 22, that in turn makes for a diminution of voltage of the generator, and these alternate and rapidly reoccurring controlling features of the generator voltage, maintain its voltage at a substantially constant value, whether the generator be driven at high or low speed.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper movable over the resistance element to vary the amount of resistance in a circuit; and a suction chamber connected to the intake and having a diaphragm, said diaphragm being connected to the wiper and operable by engine suction to control the wiper according to the voltage of the generator.

2. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper movable over the resistance element to vary the amount of resistance in a circuit; a suction chamber connected to the intake manifold and having a diaphragm, said diaphragm being connected to the wiper and operable by engine suction to change the position of the wiper; and a valve responsive to generator voltage operable for regulating the suction upon the diaphragm to adjust the wiper with respect to the voltage of the generator.

3. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper; a suction chamber; a diaphragm in the said chamber connected to said wiper, a valve connected intermediate the manifold and the chamber; and means responsive to the voltage of the generator to control the valve cooperating with the suction chamber to change the position of the wiper on the resistance element, to keep the voltage of the generator substantially constant.

4. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper; a suction chamber; a diaphragm in the said chamber connected to said wiper; a valve connected to the manifold and chamber; and means responsive to engine operation to control the valve, said valve regulating a fluid pressure operable upon the suction chamber to actuate the wiper on the resistance element to control the voltage of the generator.

5. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; an arm movable over the resistance element to complete a circuit through the field coil; means responsive to engine suction for actuating the arm; and means intermittently operable to control the suction of the engine upon the suction means for regulating the resistance of the circuit.

6. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected into the field circuit of the generator; an arm movable over the resistance element; means responsive to the suction of the engine to decrease the resistance in the circuit; and means responsive to the voltage of the generator to regulate the suction of the engine to said suction responsive means to increase the resistance in the circuit.

7. A current regulating device for an internal combustion engine comprising in combination; a generator; a resistance element connected into the field circuit of the generator; an arm movable over the resistance element; means responsive to the suction pressure of the engine to actuate the arm to increase the resistance in the circuit; and means responsive to the voltage of the generator to control the suction pressure to the responsive means to actuate the arm to decrease the resistance in the circuit.

8. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a variable resistance in circuit with the generator; means for altering the resistance in response to engine suction; and means responsive to slight variations of generator voltage for augmenting the effect of engine suction upon the said resistance, said altering means and said augmenting means being reactive upon each other to maintain the voltage of the generator substantially constant throughout all useful generating speeds of said generator.

9. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper actuated by said suction device and movable

over the resistance, said device subjected to the fluid pressure developed in said intake; and means responsive to the voltage of the generator to control the fluid pressure to said suction device for controlling said wiper to vary the resistance in the field circuit of said generator.

10. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper actuated by said suction device and movable over the resistance, said device subjected to the fluid pressure developed in said intake; and means for effecting the fluid pressure to said suction device for actuating the same to move said wiper to vary the resistance in the field circuit according to the voltage of the generator.

11. In a current regulating device for maintaining the voltage of a generator constant, the combination comprising; an engine having an intake for driving the generator; a suction device connected with the intake; a resistance element connected with the field coil of the generator; a wiper actuated by said suction device and movable over the resistance, said device subjected to the fluid pressure developed in said intake; and means responsive to the voltage of the generator to control the fluid pressure to the suction device to effect proper adjustment of the wiper according to the voltage requirements of said generator.

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