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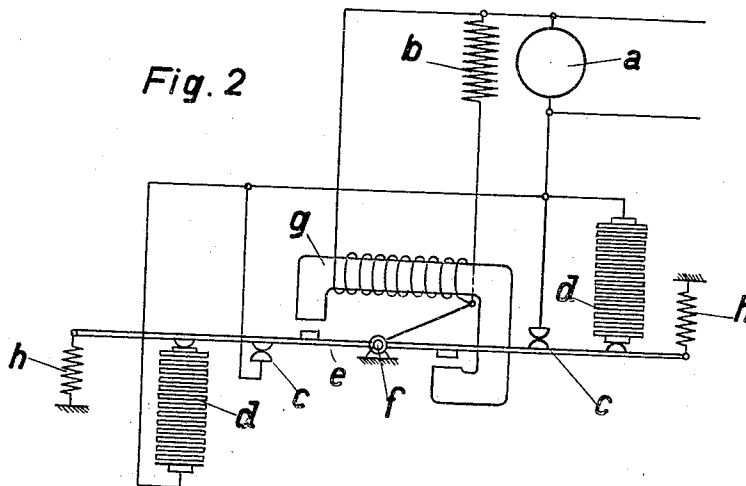
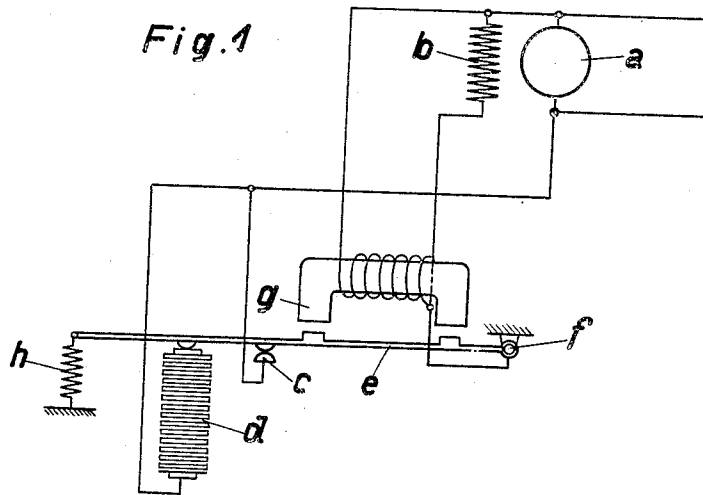
H. MEYER-BERG ET AL

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QUICK ACTING REGULATOR OF THE VIBRATING TYPE

Filed May 24, 1928

2 Sheets-Sheet 1



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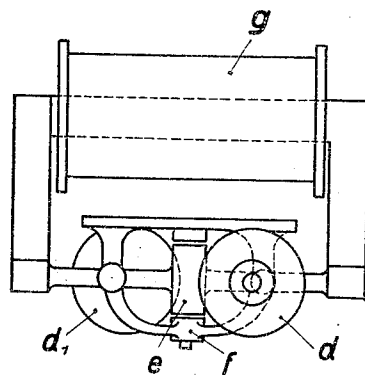
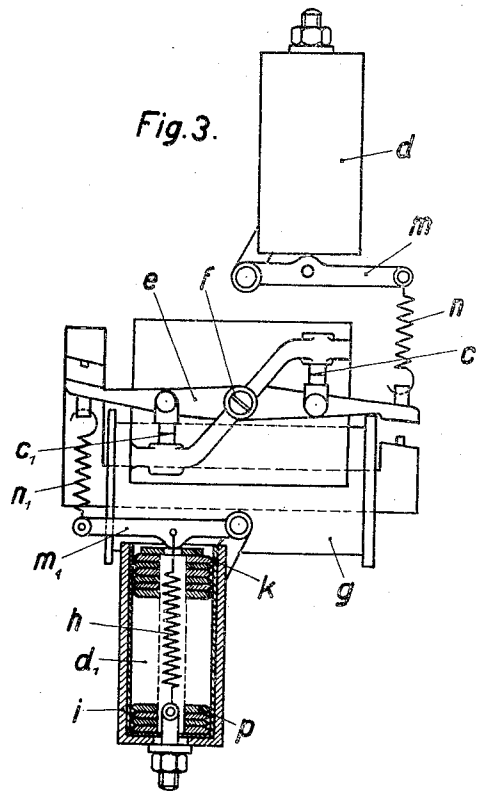
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QUICK-ACTING REGULATOR OF THE VIBRATING TYPE

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For regulating train-lighting generators to keep the voltage or the current constant, both regulators of the vibrating type and of the carbon compression type are used. Both types of regulators have considerable disadvantages which closely circumscribe their use in spite of their great mechanical simplicity.

The disadvantage with the trembler regulator is, that the trembler contacts are subject to rapid destruction, owing to their being excessively stressed. This is due to the fact that, when the contacts are being opened, there is too great a difference in voltage between the contacts. This difference in voltage is due to the rigid resistance connected up parallel to the trembler contacts. Consequently, each time the contacts are opened an arc is formed, the intensity of which depends on the strength of the excitation current and the drop in voltage. Although by using a resistance having a number of steps the forming of sparks by the contacts is diminished, it is still far too great when a considerable excitation current flows, so that in this case as well the life of the vibrating contacts is very short. In the case of the carbon compression type regulator, the disadvantages make themselves felt in this way, that the ohmic resistance of the carbon column is not constant, but is subject to considerable variations in the course of time according to the structure of the carbon. This interferes seriously with the fine regulation, so that the carbon compression regulator can only be made use of in cases where no very accurate regulation is required.

The present invention has for its object to provide a quick-acting regulator in which the advantages of the mechanical simplicity of the vibrating regulator and of the carbon compression regulator are fully realized, while the electrical disadvantages of the same are avoided. According to the invention a regulable non-inductive resistance is connected up in parallel to the vibrating or tremble contact of a regulator, which resistance can be adjusted between a minimum and a maximum value. As the regulable resistance a carbon compression regulator is pre-

erably used, which by coacting with the vibrating contact allows of a fine regulation in direct dependence on the excitation of the generator.

In the accompanying drawings Figs. 1 and 2 show diagrammatically the arrangement of a single regulator and of a double regulator according to the invention and Figs. 3 and 4 show a constructional example of the latter in elevation and plan view.

In Fig. 1 of the drawings *a* is the armature of the train-lighting dynamo and *b* the excitation winding. The regulator is composed of the vibrating or tremble contacts *c* and of the carbon compression regulator *d* connected in parallel to the said contacts. The vibrating contact proper, *c*, and the member exerting the pressure on the plates of the carbon compression regulator, which are arranged in layers to form a column, are mounted on a lever *e* common to both, which is pivoted at *f* and forms the armature of an electromagnet *g*. The electromagnet *g* is energized in dependence on the current or voltage of the dynamo *a* and is connected for instance to the terminals of the excitation winding *b*. *h* is an initially stressed spring which regulates the pressure of the carbon plates of the regulator and thereby determines the resistance value of the latter. The spring *h* has the further function of keeping the vibrating contacts closed. The initial stressing of the spring *h* is so adjusted that in the position of rest of the regulator with the vibrating contacts *c* closed, the pressure on the carbon plates is at a maximum, that is equal to zero. After the contacts *c* have been opened, the pressure on the carbon plates of the regulator is reduced, the spring *h* being stressed, and the resistance value of the regulator is increased as the distance between the contacts increases, up to a maximum value. The regulator operates in the following manner: When the vehicle fitted with the train-lighting dynamo is in the starting position, the field circuit of the dynamo being complete, current will flow from the excitation winding *b* over the pivot *f* of the lever *e* and the lever itself, through the closed vibrating contacts *c* and parallel thereto over the car-

bon compression regulator d to the armature a of the dynamo. As the dynamo voltage increases the electromagnet g will become operative, will attract its armature e and lift the vibrating contact proper c from its fixed counter-contact. At the moment of opening of the contacts the maximum pressure of the spring h will still be maintained on the plates of the carbon compression regulator, so that the resistance value of the latter will remain at its minimum value. In this way the difference in voltage between the vibrating contacts is kept low and the formation of destructive sparks on the contacts opening is prevented. On the air gap between the vibrating contacts increasing with the increase in voltage, the pressure on the carbon plates of the regulator will decrease, the spring h being at the same time unstressed, and the resistance value of the regulator will increase in the same proportion. On the dynamo voltage falling, the vibrating contacts may approach one another again, the resistance value of the carbon compression regulator will decrease and will reach its minimum value, when the vibrating contacts close.

Fig. 2 shows diagrammatically the combination of two regulators according to Fig. 1 to form a double regulator. The armature e has the form of a two-armed lever and is so balanced that it can be mounted on points so as to avoid friction. The electromagnet g is U-shaped, so that its poles lie on either side of the two-armed armature e . The two regulators are arranged symmetrically with respect to the centre line of the armature e and their vibrating contacts are connected in parallel, so that the current supplied to the regulator is distributed to the two contacts. The vibrating contacts of the two regulators may, however, be connected in series. This double construction of a regulator, the contacts of which are controlled synchronously, has the special advantage that, should one half of the regulator become damaged, the second half will still continue to function.

A constructional form of such a double regulator is shown by way of example in Figs. 3 and 4 in elevation and plan view respectively. The same reference letters refer to the same parts as in Fig. 1. The operation of the regulator is the same as that described above.

According to the invention the spring h which regulates the compression pressure of the carbon plates of the carbon compression regulator is suitably placed in the interior of the carbon compression regulator itself. For this purpose the carbon plates which are piled to form a column are provided with a bore and the helical spring h is mounted in the channel thus formed. One end of the spring is attached in a regulable manner to the casing i of the regulator, the other end

being attached to the pressure applying member k which rests on the carbon discs. The channel formed by the bores in the plates at the same time acts as an air passage for cooling the regulator. The compression pressure for the carbon plates of the regulator instead of being transmitted directly through the armature as in Figs. 1 and 2, can be transmitted by way of an interposed pressure applying bar or spring or through a system of levers with mechanical advantage, as shown in Fig. 4. In the example the compression pressure acting on the carbon plates p of the carbon compression regulator d , d_1 is regulated in such a way that the springs h are attached to levers m , m_1 which are pivoted to the regulator casing and are connected by the helical springs n , n_1 to the ends of the two armed armature e .

The increase in the resistance value of the carbon compression regulator produced by the diminution of the compression pressure acting on the plates can be assisted by the weight of the plates themselves, the regulator being so mounted that the open end of the regulator casing is directed vertically downwards.

What we claim is:

1. A quick-acting regulator of the vibrating type for maintaining constant the current or voltage of an electric generator including a pair of vibrating contacts in a circuit including the field coils of the generator, a non-inductive resistance shunted across said contacts and a rocking member coacting synchronously with the vibrating contacts, said rocking member being arranged to vary the value of said non-inductive resistance from a minimum to a maximum synchronously with the vibration of the said contacts.

2. A quick-acting regulator of the vibrating type as claimed in claim 1 wherein the said non-inductive resistance is in the form of a compressible pile of carbon plates.

3. A quick-acting regulator as claimed in claim 1 wherein the non-inductive resistance is a compressible carbon plate resistance, the magnitude of which is varied by varying the pressure on its plates by means of the rocking member in such a manner that when the vibrating contacts are closed the pressure is high and the resistance value low whilst after the contacts open the resistance value increases in dependence upon the decrease in pressure.

4. A quick-acting regulator as claimed in claim 1 wherein the non-inductive resistance is a compressible carbon plate resistance, the magnitude of which is varied by varying the pressure on its plates by means of the rocking member in such a manner that when the vibrating contacts are closed the pressure is high and the resistance value low whilst after the contacts open the resistance value in-

creases in dependence upon the decrease in pressure, the increase in the resistance value produced by the reduction in the pressure on the plates being assisted by the weight
5 of the plates themselves.

5. A quick-acting regulator as claimed in claim 1 including an initially stressed spring and wherein the non-inductive resistance is a compressible carbon plate resistance, the
10 magnitude of which is varied by varying the pressure on its plates by means of the rocking member in such a manner that when the vibrating contacts are closed the pressure is high and the resistance value low
15 whilst after the contacts open the resistance value increases in dependence upon the decrease in pressure, the pressure on the plates of the carbon compression resistance being produced by the said initially stressed spring

20 6. A quick-acting regulator as claimed in claim 1 including an initially stressed spring and wherein the non-inductive resistance is a compressible carbon pile resistance, the magnitude of which is varied by varying the
25 pressure on its plates by means of the rocking member in such a manner that when the vibrating contacts are closed the pressure is high and the resistance value low whilst after the contacts open the resistance value in-
30 creases in dependence upon the decrease in pressure, the pressure on the plates of the carbon compression resistance being produced by the said initially stressed spring which is guided centrally through a passage
35 formed in each plate.

7. A quick-acting regulator as claimed in claim 1 including an initially stressed spring and wherein the non-inductive resistance is a compressible carbon pile resistance, the
40 magnitude of which is varied by varying the pressure on its plates by means of the rocking member in such a manner that when the vibrating contacts are closed the pressure is high and the resistance value low whilst
45 after the contacts open the resistance value increases in dependence upon the decrease in pressure, the pressure on the plates of the carbon pile resistance being produced by the said initially stressed spring which is guided
50 centrally through a passage formed in each plate, the combined passage formed through the pile of plates forming a ventilating duct for cooling the resistance.

In testimony whereof we have signed our
55 names to this specification.

HULDREICH MEYER-BERG.
ROBERT KELLER.