

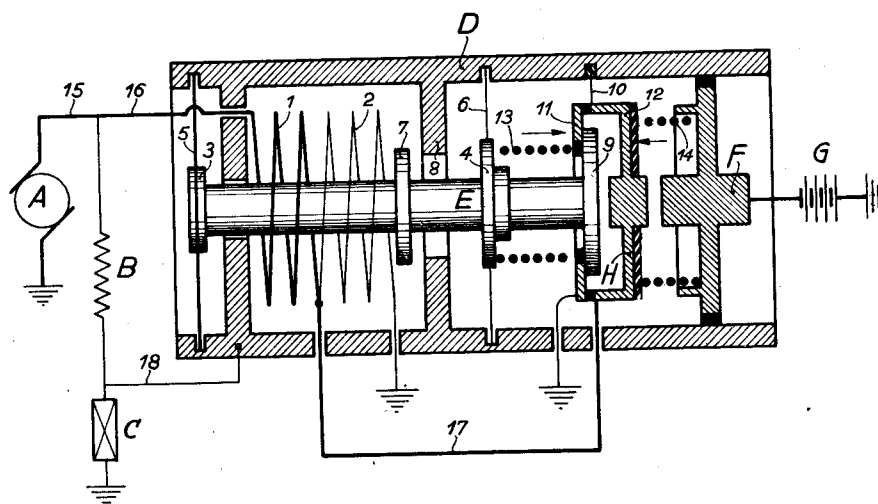
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COMBINED AUTOMATIC SWITCH AND REGULATOR

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UNITED STATES PATENT OFFICE

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COMBINED AUTOMATIC SWITCH AND REGULATOR

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The invention relates to a combined automatic switch and voltage regulator in which a single armature operates the switch and the regulator and is particularly adapted for the lighting sets of motor vehicles.

More especially the voltage regulator is of the vibration type. The primary object of the invention resides therein that the combined switch and regulator is so designed as to have a plurality of regulating stages so that even on considerable increase of voltage the regulation of the excitation of the dynamo is possible. Other objects and features will become apparent from the subsequent description.

A preferred embodiment of the invention is shown diagrammatically and by way of example in the single figure of the accompanying drawing.

A indicates the armature of a dynamo, B the excitation winding for the same and C a resistance in series with the excitation winding. A magnet casing D contains a current coil 1 and a voltage coil 2 connected thereto and in the inner chamber of the casing is located an armature E suspended by flanges 3 and 4 from two flat springs 5 and 6. This armature, which has an annular shaped extension 7, which yields to magnetic attraction of a flange 8 of the casing D, is formed at one end with a plate 9 which constitutes the vibrating contact element of a vibration voltage-regulator. A fixed abutment F is located at the one end of the casing D, while a movable carriage element H consisting of two contact blocks 11 and 12 insulated from one another is suspended by a flat spring 10 between the abutment F and the armature E. The member F constitutes also the stationary contact element of the automatic switch, while the projecting portion of the member 12 adjacent the member F constitutes the movable contact element of the automatic switch. The projecting portion of the member 12 adjacent the center of the vibrating contact element 9 constitutes a complementary contact therefor. The member 11 constitutes another complementary contact for the vibrating contact element 9. The carriage element H

thus carries the movable contact of the automatic switch, and two contacts complementary to the vibrating contact element 9.

Two spiral spring 13 and 14, the former bearing against the flange 4 of the armature, and the latter against the frame of the abutment F act on the carriage element H.

The spring 13 is stronger than 14 and is also electrically insulated from the contact block 11.

The current coil 1 is connected to one brush of the dynamo A by a lead 15, 16 and to the contact block 12 by a lead 17 whilst the contact block 11 and also the second brush of the dynamo and the free end of the voltage coil 2, the series resistance C and a battery G are grounded. The lead 18 to the magnet casing D is connected between the excitation winding B and the series resistance C. The pole of the battery G not connected to ground is connected with the abutment F. The spring 10 and the abutment F are insulated from the casing D.

Immediately a potential difference is set up by the dynamo and the excitation of the coils 1 and 2 causes the projection 7 of the armature to be moved towards the right attracted by the flange 8. The carriage element H is also affected by the spring 13. The contact between the plate 9 and the contact element 11 previously maintained by this spring is still maintained. With a suitable voltage of the dynamo the armature E and also the carriage element H move sufficiently far to ensure contact between the element 12 and the abutment F whereby the battery G is connected through the circuit F, 12, 17, 1, 16, 15 with the dynamo A, B.

With increase of voltage the armature E moves further to the right. As the carriage element H is prevented from taking part in this further movement by the fixed abutment F, the armature plate 9 is thus separated from the contact element 11 and the series resistance C is inserted in the circuit of the field winding B. Accordingly the process of regulation between the two contact elements 9 and 11 begins after the manner of a vibration regulator, the series

resistance C being alternately switched in and out.

If the voltage increases still further the armature E finally moves so far to the right that the plate 9 contacts with the contact element 12 and the excitation winding B is short circuited through 16, 1, 17, 12, 9, E, D, 18.

If the speed of rotation of the dynamo is reduced to such an extent that the voltage of the dynamo is less than the battery voltage, the current flows in the reverse direction from the battery through the current coil 1 so that the action of the voltage coil 2 is completely eliminated and the armature E is drawn back by the springs 13 and 14. The carriage element H also must partake in this movement with the result that the contact between the abutment F and the contact element 12 is again broken and the battery G is cut off from the dynamo.

The automatic switch and the vibration regulator can be combined to form a very cheap and compact construction in the form of construction described, which further particularly shows an advantage over known regulating switches in that the two contacts of the automatic cut-on switch do not move in any way during the operation of the regulator vibrating contacts.

In the foregoing description, I have shown but one form of the embodiment of my invention, but many modifications therefrom may be made without departing from the spirit of the invention, and accordingly I do not limit myself to the specific form shown herein.

I claim:

1. In a combined automatic switch and vibration voltage regulator for generators, the combination of a switch element, a vibration voltage-regulator element, a single armature operating the switch and the regulator, and a plurality of separate regulating circuits controlled by the regulator at different times for the regulation of the voltage of a generator.

2. In a combined automatic switch and vibration voltage regulator for generators, the combination of a switch element, a vibration voltage-regulator element, a single armature operating the switch and the regulator, said regulator being arranged to assume a plurality of control positions, one adapted to insert a resistance in the excitation circuit of a generator and another to render inoperative the excitation winding by shunting the same.

3. In a combined automatic switch and vibration voltage regulator for generators, the combination of a switch element, a vibration voltage-regulator element, a single armature operating the switch and the regulator, said vibration voltage-regulator comprising a vibrating contact element, and a

movable contact element mounted independently of said armature and adapted to be moved by it into a stationary position wherein it acts as a contact element complementary to the vibrating contact element of the regulator.

4. In a combined automatic switch and voltage regulator, the combination with a single armature operating the switch and the regulator, of a plurality of control stages of the regulator, a movable contact element provided with multiple contacts, mounted independently of said armature and adapted to be moved by it, and flat springs for suspending all the movable elements, all contacts being mounted in line with one another.

5. In a combined automatic switch and vibration voltage-regulator for generators, the combination of a switch having a movable and a stationary contact, a single armature, a movable carriage element mounted independently of the armature and adapted to be moved by the armature in its attractive movement from a normal position to an extreme operated position, said carriage element carrying the movable contact and arranged to move it into engagement with the stationary contact, an abutment arranged to stop the movement of the carriage element after engagement of said contacts, determining its extreme operated position, a non-vibrating regulating contact carried by said carriage element and a vibrating regulating contact mounted on the armature and normally in engagement with said non-vibrating contact and arranged to be moved out of engagement with said non-vibrating contact in the further attractive movement of the armature after engagement of the carriage element with the abutment.

6. The combination claimed in claim 5 in which the stationary switch contact is arranged to act as the said abutment.

7. In a combined automatic switch and vibration voltage-regulator for generators, the combination of a switch having a movable and a stationary contact, a single armature, a movable carriage element mounted independently of the armature and adapted to be moved by the armature in its attractive movement from a normal position to an extreme operated position, said carriage element carrying the movable contact and arranged to move it into engagement with the stationary contact, an abutment arranged to stop the movement of the carriage element after engagement of said contacts, determining its extreme operated position, first and second non-vibrating regulating contacts carried by the carriage element, a vibrating regulator contact mounted on the armature normally in engagement with said first non-vibrating contact and arranged to be moved out of engagement therewith in

the further attractive movement of the armature after engagement of the carriage element with the said abutment, and to be moved into contact with the said second non-vibrating contact in the further attractive movement of the armature after disengagement of the vibrating contact from said first non-vibrating contact.

8. The combination as claimed in claim 7 in which the said stationary switch contact is arranged to act as the abutment.

9. In a combined automatic switch and vibration voltage-regulator for generators, the combination of a single armature, a movable carriage element mounted independently of the armature and adapted to be moved by it, a plurality of contacts carried by said carriage and insulated from each other, other contacts complementary to said insulated contacts and mounted for relative movement therewith in a common straight line at right angles to the planes of the contacting surfaces of said contacts.

In testimony whereof I have hereunto affixed my signature.

FRIEDRICH MENZEL.