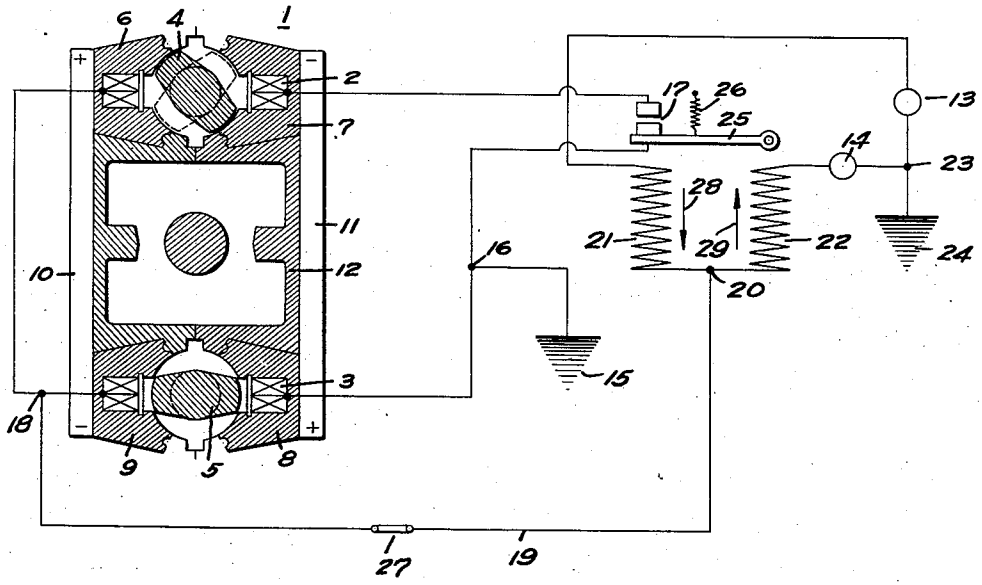
March 2, 1926. 1,575,538

J. B. BUSHNELL

AUTOMOBILE LIGHTING SYSTEM

Filed August 11, 1923



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UNITED STATES PATENT OFFICE.

JOHN B. BUSHNELL, OF BERKELEY, CALIFORNIA, ASSIGNOR TO N. R. HARRIS AND M. C. HARRIS, BOTH OF SAN FRANCISCO, CALIFORNIA, COPARTNERS, DOING BUSINESS UNDER THE FIRM NAME OF HARRIS ELECTRIC COMPANY.

AUTOMOBILE LIGHTING SYSTEM.

Application filed August 11, 1923. Serial No. 656,955.

To all whom it may concern:

Be it known that I, JOHN B. BUSHNELL, a citizen of the United States, and a resident of the city of Berkeley, in the county of Alameda and State of California, have invented a new and useful Automobile Lighting System, of which the following is a specification.

This invention relates to a system for supplying electric power to the headlights of an automobile, and more particularly to such a system in which the source comprises a generator coupled to the motor engine.

In such systems there is necessarily a large variation in the motor speed and consequently in the generator speed. Usually the generator is arranged to supply substantially constant output irrespective of the generator speed, so that there may be no objectionable variation in the lamp brilliancy. Where several lamps are operated as is usual from a single generator, it has been customary to utilize a series connection for them in order to insure equal lighting from all of them, and thus in case one should burn out or break, the entire lighting system would become open circuited and inoperative. It is one of the objects of my invention to insure against failure of the entire system when only some of the lamps are out of order.

The series arrangement of the lamps has further disadvantages which my invention overcomes. The lamps used in such systems as supplied commercially on the market do not have uniform characteristics, and there is no assurance that equal currents through them will produce equal brilliancy. Since even a slight deviation from the desired current flow may cause a large difference in brilliancy, it is evident that there is apt to be a considerable disparity between the lamps when they are lit. It is thus another object of my invention to provide a system of this character in which the lamps are maintained at substantially the same brilliancy.

With my invention I connect the lamps in parallel, and in this way it is assured that the same operating voltage will be impressed on each; there is thus an assurance that the brilliancy will be equal, since the lamps are rated in impressed voltage. In case one of the lamps should burn out, the others would still be active; however, since the generator is of the constant output type, if no further provisions were made, too much current would be supplied to the remaining lamps, and they would quickly burn out. It is another object of my invention, therefore, to provide a regulated current so that no excess is supplied when any of the lamps become inactive. In its broadest aspect, this feature of my invention is not limited to an automobile lighting system, but may readily be utilized in any system where a number of translating devices such as lamps are placed in parallel, and where the current is supplied to them from one or more generators that have substantially a constant output characteristic.

My invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. Although in the drawings I have shown but one embodiment of my invention, I do not desire to be limited thereto, since the invention as expressed in the claims may be embodied in other forms also.

Referring to the drawings:

The single figure is a wiring diagram illustrating one form of system embodying my invention.

In this figure I illustrate a generator 1, in which there are at least two sets of generating coils 2 and 3. The particular form is of the type described and claimed in an application filed in my name on Feb. 27, 1922, entitled "Dynamo electric machine", and bearing Serial Number 539,387. The generator is of the inductor type, comprising one or more rotating elements or rotors 4 and 5, arranged to vary the number of lines of magnetic force that pass through the coils 2 and 3. Of course other types of constant output generators may be used, the requirement being merely that more than one generating coil is provided. The magnetic circuit in the present instance includes the pole pieces 6, 7, 8, and 9, and the permanent bar

magnets 10 and 11, all suitably supported as by the casting 12 of non-magnetic material. Each of the pole pieces has a slot for accommodating the coils 2 and 3. Furthermore the rotors 4 and 5 are driven in unison from the engine shaft. The complete circuit includes in series the magnet 10, pole piece 6, rotor 4, pole piece 7, magnet 11, and pole pieces 8 and 9.

In the position shown, assuming that the polarities of the magnets 10 and 11 are such as indicated, the magnetic flux threading coil 2 emanates from above and passes through rotor 4 in a downward direction through the coil. A 90° rotation of rotor 4 to the dotted line position will obviously reverse the flux direction, and an E. M. F. will be generated in the process of reversal. Continued rotation will cause a cyclic reversal, and an alternating E. M. F. will result, the frequency depending upon the speed of rotation of rotor 4. This mode of operation is duplicated with the coil 3 and rotor 5, and it is therefore unnecessary to describe it in detail. It has been found that a generator constructed as shown is capable of supplying a substantially constant output irrespective of the speed of rotation of the engine.

Several sets of lamps, such as 13 and 14, are arranged in multiple and are connected to the generator 1. The circuit between the lamps and the generator may be traced as follows: from a grounded connection 15 to a point 16, where the circuit divides, one path including coil 3, and the other a pair of normally closed contacts 17 and coil 2; at point 18, the circuits reunite, and the reunited circuit continues through connection 19 which may include a manually operated control switch 27, to a point 20, where the circuit again divides into as many paths as there are sets of lamps, and each path including a coil 21 or 22; these paths reunite at point 23, and the circuit continues through the grounded connection 24.

It is evident from the description as thus far outlined, that both coils 2 and 3 in parallel supply the entire load, and that this load includes two or more sets of translating devices. Now in case one of the lamps 13 or 14 should become inactive due to breakage, or burning out, or to any other cause, all of the generating coils would supply their current to the remaining lamp; this would increase its brilliance unduly, and in a very short time it too would burn out. It is to obviate such an occurrence, that I provide the contacts 17, which are operated in response to the inactive condition of one of the lamps to render one of the coils 2 and 3 inoperative to supply current. In order to accomplish this result, the contacts 17 are arranged to open the circuit for coil 2, and thereby leave only coil 3 active. The control of contacts 17 is effected by the aid of an armature 25 which is biased to close the contacts, as by a spring 26, but which is under the influence of the magnetic fields produced by the coils 21 and 22. These coils are so arranged that with both lamps active and switch 27 closed, the fields of the coils cancel each other, or neutralize; in other words, coils 21 and 22 are differentially wound, as indicated by the arrows 28 and 29. Since the lamps take about the same current, the coils 21 and 22 must be wound with substantially the same number of turns to secure this effect, and they must have a common magnetic circuit, of which armature 25 forms a part. As soon as any of the lamps become inactive, the currents no longer balance in coils 21 and 22, and there is a resultant magnetic field strong enough to overpower spring 26 and to open the contacts 17. The opening of these contacts reduces the volume of current supplied, in the proper proportion so that the active lamp does not become unduly loaded.

It is thus seen that the volume of current supplied is directly dependent upon the number of translating devices which is being supplied. As soon as the inoperative lamp or other translating device is replaced, the armature 25 is restored to its closing position, due to the neutralization of the magnetomotive forces of coils 21 and 22. Thus the entire operation is rendered automatic.

I claim:

1. In a system for supplying electrical energy, a plurality of translating devices arranged in parallel, a source of current therefor, and means for controlling the amount of current produced by said source, comprising a device for balancing the currents supplied to the translating devices, and contacts operated by the said device in response to a condition of substantial unbalance in the currents supplied to each of the translating devices.

2. In a system for supplying electrical energy, a plurality of translating devices arranged in parallel, a source of current therefor, and means for controlling the amount of current produced by said source, comprising a differentially wound magnet arranged to have its flux substantially neutralized only when all of the translating devices are active; and contacts operated by said magnet in response to a departure from its neutralized state.

3. In a system for supplying electrical energy, a plurality of translating devices arranged in parallel, a source of current therefor having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a device for balancing the currents supplied to the translating devices, and contacts operated by said

device in response to a condition of unbalance in the currents supplied to each of the translating devices.

4. In a system for supplying electrical energy, a plurality of translating devices arranged in parallel, a source of current therefor having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a differentially wound magnet arranged to have its flux substantially neutralized only when all of the translating devices are active, and contacts operated by said magnet in response to its departure from its neutralized state.

5. In a system for supplying electrical energy, a plurality of translating devices arranged in parallel, a source of current therefor, and means for varying the amount of current produced by said source, comprising a plurality of coils, one for each translating device, each of these coils being associated with its translating device in such a way that there is a material change in its magneto-motive force when there is a change from active to inactive condition or vice versa of the translating device, and contacts controlled by the combined action of all of the coils.

6. In a system for supplying electrical energy, a plurality of translating devices, arranged in parallel, a source of current therefor having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a plurality of coils, one for each translating device, each of these coils being associated with its translating device in such a way that there is a material change in its magneto-motive force when there is a change from active to inactive condition or vice versa of the translating device, and contacts controlled by the combined action of all of the coils.

7. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, and means for controlling the amount of current produced by the generator, comprising a device for balancing the currents supplied to the sets of lamps, and contacts operated by said device in response to a condition of unbalance in the currents supplied to each of the sets of lamps.

8. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, and means for controlling the amount of current produced by the generator, comprising a differentially wound magnet arranged to have its flux substantially neutralized only when all of the sets of lamps are active, and contacts operated by said magnet in response to a departure from its neutralized state.

9. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, said generator having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, operated in response to the variation in the number of sets of lamps that is connected to the generator.

10. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, said generator having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a device for balancing the currents supplied to the sets of lamps, and contacts operated by said device in response to a condition of unbalance in the currents supplied to each of the sets of lamps.

11. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, said generator having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a differentially wound magnet arranged to have its flux substantially neutralized only when all of the sets of lamps are active, and contacts operated by said magnet in response to its departure from the neutralized state.

12. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, and means for varying the amount of current produced by

said generator, comprising a plurality of coils, one for each set of lamps, each of these coils being associated with its set in such a way that there is a material change in its magnetomotive force when there is a change from active to inactive condition or vice versa of the set of lamps, and contacts controlled by the combined action of all of the coils.

13. In an automobile lighting system, a plurality of sets of lamps in parallel, a generator adapted to be driven by the source of motion for the automobile, the variation in speed of the source causing no large variation in the current output of the generator, said generator being arranged to supply current to the lamps, said generator having a plurality of generating coils adapted to be arranged in parallel, and means for varying the number of active coils in parallel, comprising a plurality of magnet coils, one for each of the sets of lamps, each of these coils being associated with its set of lamps in such a way that there is a material change in its magnetomotive force when there is a change from active to inactive condition or vice versa of the set of lamps, and contacts controlled by the combined action of all the coils.

14. In an automobile lighting system, a generator having a pair of generating coils, said generator being adapted to be driven by the source of motion for the automobile, and said coils having a substantially constant current output irrespective of generator speed, and arranged to be connected in parallel, a pair of sets of lamps connected in parallel, and arranged to be supplied with current from the generating coils in parallel, and means for disconnecting one of the generator coils in response to the existence of an inoperative condition of either of the sets of lamps, comprising an electromagnet having a pair of differentially wound coils, one for each of the lamp sets and arranged to carry the lamp current, an armature for the electromagnet, said electromagnet when both sets of lamps are active being ineffective to attract the armature, but when either of the two differentially wound coils becomes deenergized, due to the interruption in the lamp current, the resultant magnetism exerted by the other coil is sufficient to attract the armature, and a pair of contacts, one carried by the armature, which are closed when the armature is in its unattracted position, said contacts being in series with one of the generating coils.

In testimony whereof, I have hereunto set my hand.

JOHN B. BUSHNELL.