G. & L. INRIG.

DYNAMO ELECTRIC GENERATOR.

APPLICATION FILED JULY 20, 1912.

1,079,008.

Patented Nov. 18, 1913.

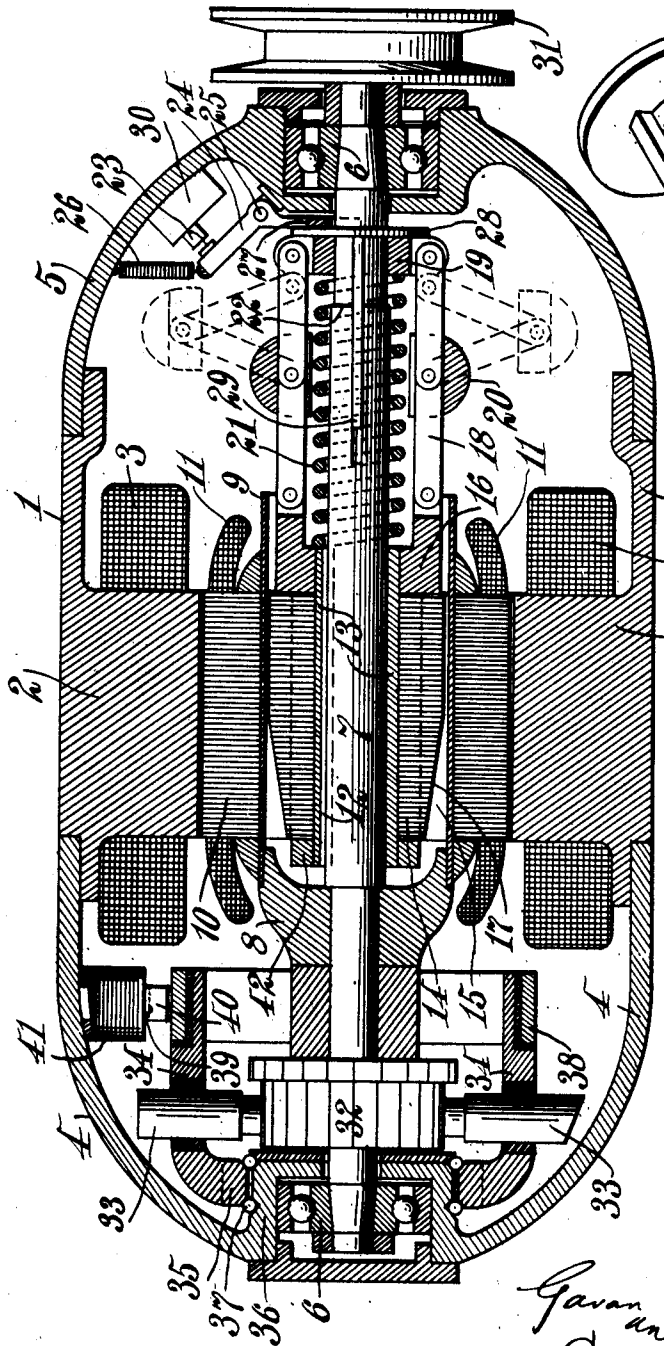


Fig. 1.

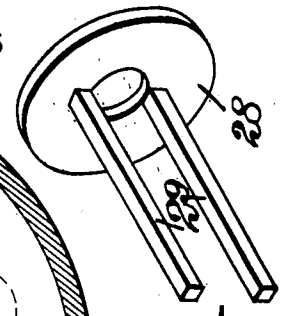


Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

GAVAN INRIG AND LEON INRIG, OF LONDON, ENGLAND, ASSIGNORS TO ROBERT L. HUBLER AND GEORGE S. GREENE, BOTH OF DAYTON, OHIO.

DYNAMO-ELECTRIC GENERATOR.

1,079,008. Specification of Letters Patent. Patented Nov. 18, 1913.

Application filed July 20, 1912. Serial No. 710,537.

To all whom it may concern:

Be it known that we, GAVAN INRIG and LEON INRIG, subjects of the King of Great Britain, residing at London, county of Middlesex, Kingdom of Great Britain, have invented certain new and useful Improvements in Dynamo-Electric Generators; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

Our invention relates to certain new and useful improvements in dynamo electric machines and is especially adapted to be used in connection with storage batteries in localities where the driving means such as the car axle, is subject to be driven at variable speed.

The object of the invention is to provide means for breaking the circuit of the dynamo when the speed thereof falls below or rises above certain predetermined speeds, all as will hereinafter more fully appear.

Referring to the accompanying drawings, Figure 1 is a longitudinal sectional elevation through a dynamo constructed according to our invention; and Fig. 2 is a detail perspective view of the switch actuator.

Throughout the specification and drawings, similar reference characters indicate corresponding parts.

Referring more particularly to the drawings, 1 represents the shell of the dynamo, 2 the pole pieces and 3 the field coils. Extending from the shell 1 are end casings 4 and 5 which receive bearings 6 for the shaft 7. Mounted on the shaft 7 is the armature, the novel features of which form the subject matter of our co-pending application, Serial No. 701,608, filed June 4, 1912, and which is constructed as follows: On the said shaft 7 is a non-magnetic head 8 which supports an iron cylinder 9 on which an armature 10 is mounted. The armature 10 is provided with the usual aramture coils 11. In the interior of the cylinder 9 and splined to the shaft 7, by means of a key 12, is a non-magnetic sleeve 13 which supports an armature core 14. The core 14 is provided with guides 15 which engage the inner side of the cylinder 9 and thereby support the armature which is overhung from the head 8. The said armature core 14 is secured on the sleeve 13 by a collar 42 and a head 16, and is moved along the shaft 7, under the influence of a governor, controlled by the speed of the said shaft. When the said core 14 is moved out of the cylinder 9, as when the speed of the shaft is increased, the air gap between the pole pieces is increased, and consequently the magnetic lines of force are descreased and the current generated is maintained constant. When the said core 14 is moved back into the cylinder 9, as when the speed of the shaft is decreased, the air gap is accordingly reduced and thus a constant current is maintained. The increase in the speed of the shaft is counteracted by the increase of the air gap or magnetic resistance, and the decrease in the speed is accordingly counteracted by the decrease of the air gap. The core 14 may be made tapered or conical as at 17 to more effectively control the magnetic lines of force. As has been stated, the core 14 is moved out of the cylinder 9 by a governor when the speed of the shaft increases, and is moved into the cylinder 9 when the speed decreases. The governor is constructed as follows:

Attached to the head 16 are pivotal governor links 18, which are also attached to a ring or collar 19 slidably mounted on the shaft 7. The links 18 are connected with governor balls 20. On the shaft 7, between the head 16 and the ring 19, is a spring 21, which exerts a tendency to move the core 14 into the cylinder 9 while the balls 20, under the action of centrifugal force, exert a tendency to move the core 14 out of said cylinder 9 as will be clearly understood. As a consequence, when the speed of the shaft 7 increases, the said core will be drawn out by the action of the governor, and when the speed decreases, the core will be moved into the cylinder 9 by the action of the spring 21.

The ring 19 is, as stated, slidingly mounted on the shaft 7, and the movement thereof is limited by a shoulder 22 on the shaft 7. The said ring 19 controls a switch 23 connected into the dynamo circuit leading to the storage batteries or accumulators. One point of the said switch is mounted on an insulated block 30 attached to the casing 5, and the other point of said switch is

mounted on one arm 24 of a lever pivoted at 25 and which is under the control of a spring 26. The other arm 27 of said lever is bifurcated and straddles the shaft 7 and is adapted to be engaged by a loose collar or switch actuator 28 which is, in turn, in engagement with the ring 19. The collar 28 is provided with keys 29, the free ends of which are adapted to be engaged by the sleeve 13 of the core 14, when the shaft 7 reaches an excessive speed. The weight of the balls 20 and the strength of the spring 21 bear such relation to each other that, when the normal speed has been attained (at which times the dynamo will give the required voltage), the centrifugal force of the governor balls will compress the spring 21 by drawing the collar 19 along the shaft 7 until said ring reaches the shoulder 22. This movement releases the loose collar 28 and permits the spring 26 to close the switch 23. A further increase of speed draws the core 14 out of the armature thereby increasing the air gap, and thus setting up a resistance to the lines of force passing through the said armature. At an excessive speed, the core is drawn out so far that the sleeve 13 engages the ends of the keys 29, thus pushing the collar 28 back against the arm 24 of the switch lever and thereby opening the switch. When the speed falls below normal, the current from the battery is prevented from flowing through the dynamo by the open switch; and when the speed is above normal, the open switch prevents the dynamo delivering current of a higher voltage than that required by the battery or accumulator.

The shaft 7 may be provided with any suitable means, such as a pulley 31, through which the machine may be driven from any available source of power, such as the axle of a car. The direction of rotation of a car axle is, of course, subject to the direction of travel of the car, and, as the direction of flow of the current in a dynamo is subject to the direction of rotation of the armature, means are provided for automatically shifting the brushes to maintain the polarity thereof, when the shaft 7 is reversed.

The armature is provided with a commutator 32 engaged by brushes 33, there being four such brushes in this instance, although the dynamo may be constructed with any even number of brushes. The said brushes are mounted in arms 34 extending from a rocker 35. The rocker 35 is supported on a bearing or housing 36 by ball bearings 37 which permit the said rocker 35 to freely oscillate. Attached to and insulated from the free ends of the arms 34 is a ring 38 to which four projections or stops 39 are attached. These stops are adapted to engage stationary stops 40 attached to the casing 4 and which form the cores of electro magnets 41. The friction of the brushes 33 on the commutator 32 is sufficient to rotate the rocker 35, the ring 38 and the stop 39 carried thereby. When the shaft 7 and commutator 32 are rotating in either direction, the brushes will be carried around with said commutator until two of the stops 39 come in contact with the cores 40. The magnets 41 are connected in series with the field coils 3, and consequently, when the stops 39 are in contact with the cores 40, and current is flowing through the dynamo and magnets 41, the brushes will be locked in position. The said brushes are then in the position of commutation for that direction of rotation of the shaft 7. When the said shaft 7 is rotated in the opposite direction, the said brushes will be oscillated through an arc of approximately ninety degrees in this instance, which brings the brushes in the proper position of commutation for the reverse direction of rotation.

The above described brush shifting device is described and claimed in our co-pending application, Serial No. 736,292, filed Dec. 12, 1912.

We do not wish to be limited to unessential details of construction as these may be varied more or less without departing from the scope of the invention which includes any available means not heretofore known for initially closing the switch when the dynamo reaches a predetermined speed, and subsequently opening it when the dynamo reaches a higher speed.

Having described our invention, we desire to claim:

1. In a device of the type specified, a dynamo and the circuit thereof, a switch in said circuit, an actuator for said switch, two shiftable members adapted to engage said actuator at different speeds of rotation of the dynamo, and a governor driven by the dynamo and connected to said shiftable members.

2. In a device of the type specified, a dynamo, the circuit and shaft thereof, a switch in said circuit, two shiftable members on the shaft of the dynamo, said shaft being provided with a stop adapted to limit the movement of one of said shiftable members, an actuator for said switch adapted to be engaged by said shiftable members at different speeds of rotation of said shaft, and a governor connected to said shiftable members.

3. In a device of the type specified, a dynamo, the circuit and shaft thereof, a switch in said circuit, two shiftable annular members on the shaft of the dynamo, said shaft being also provided with a shoulder adapted to limit the movement of one of said shiftable annular members, a collar in operative relation with said switch, mounted on said shaft and adapted to be engaged by

one of said shiftable members, keys attached to said collar and adapted to engage the other of said shiftable annular members, a spring between said shiftable annular members, links connecting said shiftable annular members, and governor weights carried by said links.

In testimony whereof we affix our signatures, in the presence of two witnesses.

GAVAN INRIG.
LEON INRIG.

Witnesses:
CHARLES BEALE,
C. GRIERSON.