

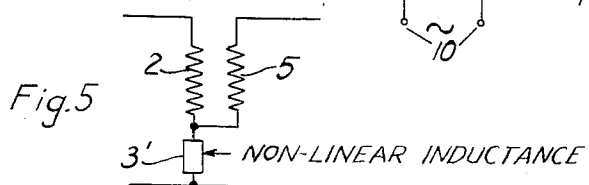
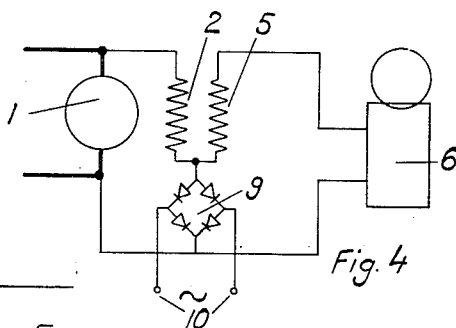
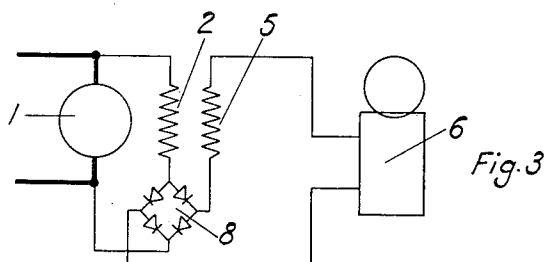
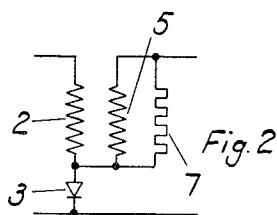
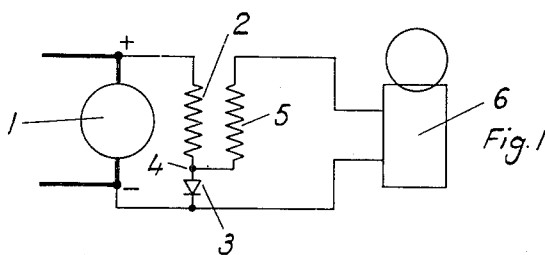
Dec. 11, 1956

U. LAMM

2,774,031

MEANS FOR VOLTAGE REGULATION BY AID OF AN EXCITER

Filed June 21, 1954



Inventor
Uno Lamm
By *Ames Lamm*
Attorney.

1

2,774,031

MEANS FOR VOLTAGE REGULATION BY AID OF AN EXCITER

Uno Lamm, Ludvika, Sweden, assignor to Allmänna Svenska Elektriska Aktiebolaget, Vasteras, Sweden, a corporation of Sweden

Application June 21, 1954, Serial No. 438,178

Claims priority, application Sweden June 22, 1953

6 Claims. (Cl. 322—79)

In the automatic regulation of a main machine utilizing an exciter it is usual to allow the exciter to magnetize itself in a manner normal for D. C. machines, so that it gives a suitable basic voltage without any outside measures being taken. Usually a shunt winding is necessary for this purpose. Further a co-acting or counter-acting magnetization component is supplied from a regulator, e. g. through a control winding, whereby the voltage of the exciter can be controlled in a way determined by the regulator.

In known regulating arrangements operating according to this principle, there is usually the risk that the polarity of the exciter becomes reversed. This can arise when during regulation the counter-acting excitation component derived from the regulator becomes so large and can act for such a length of time that the flux of the exciter changes its direction. When this happens, the action of the regulator becomes reversed, i. e. instead of resetting the voltage of the generator to a desired value, this will increase, so that the voltage will increase to an undesired value.

The present invention relates to means for controlling the excitation of a main machine by means of an exciter provided both with a shunt winding and a control winding, wherein the shunt winding is series connected with a uni-directional valve or with a combination of uni-directional valves and wherein the control winding in series with a regulator is series connected with the same uni-directional valve or combination of said valves.

In the accompanying drawing Figs. 1-5 show some forms of execution of the invention.

In Fig. 1, 1 designates the armature of an exciter. This has a shunt winding 2, where is series connected with a uni-directional valve 3. The uni-directional valve is so directed that it allows the current to pass through the shunt winding from the positive pole of the exciter to its negative pole. The uni-directional valve can be of the dry valve type, but any other type of valve can be used, e. g. an ionic valve or a mechanical valve, i. e. a relay which is opened if the current through its main contacts tends to change its direction.

One end of the control winding 5 is connected to a point 4 between the shunt winding 2 and the uni-directional valve 3. The valve 3 is series connected with the current circuit formed by the control winding 5 and the regulator 6. The regulator can be of any type, for instance a transductor regulator or a tube regulator. It can also be a rotating machine, e. g. a methadyne, the magnetization of which is controlled by the magnitude to be regulated.

The uni-directional valve 3 will be traversed by the differential current between the current through the shunt winding and that through the control winding. If the control winding is co-acting, these currents will be added, but if the control winding is counter-acting, the uni-directional valve will block, when the current through the control winding tends to exceed the current through

2

the shunt winding. When the uni-directional valve blocks the current in this way the windings 2 and 5 will act as series connected windings, the same current being forced to flow in both of them. When the number of turns of the windings is made equal, the resulting magnetomotive force thereof will be zero, so that the reversal of polarity is avoided.

In certain cases it is possible that the remanence in the magnetic circuit of the exciter may be lost, when the magnetomotive force of the windings is zero. Both windings can, in spite of their equal size, give different magnetomotive forces, so that the resulting magnetomotive force will be somewhat negative, whereby the risk of demagnetization is increased. Such an eventuality can be prevented by deliberately giving the shunt winding 2 a somewhat larger number of turns than the control winding 5. By this measure the voltage is also taken up more quickly after the above described operation has taken place.

If the shunt winding and the control winding have the same number of turns, it may be suitable to connect, as shown in Fig. 2, an impedance, e. g. a resistance 7, in parallel with the control winding 5. Part of the current from the regulator will then flow through this resistance, and this ensures that the magnetomotive force from the shunt winding 2 prevails over the magnetomotive force from the control winding 5, when the valve 3 blocks.

Fig. 3 shows a modification of the arrangement according to Fig. 1. The uni-directional valve according to this form is arranged as a two-pulse two-way bridge connection 8, those two terminals of the bridge 8, which are D. C. terminals when the connection is used as a rectifier, are connected in series with the shunt winding 2, and the other two terminals of the bridge are connected in series with the control winding 5.

If the control current in the opposite direction tends to exceed the current through the shunt winding 2, the upper left hand and the lower right hand valve elements will block, whilst the two remaining valve elements allow the coupling of the shunt winding and the control winding so that the same current will flow through these windings.

Fig. 4 shows a development of the arrangement according to Fig. 1. The uni-directional valve of the last mentioned arrangement is replaced by a bridge connection 9 of valve elements in two-pulse-two-way-connection, the D. C. terminals of which belong to a common current path for the shunt winding and the control winding. The A. C. terminals of the bridge connection are connected to an A. C. source at the terminals 10, from which a current can be taken which gives the exciter a basic magnetization, which can aid in preventing its demagnetization and which also can be used for accelerating the taking up of the voltage after the procedure with blocked uni-directional valves has taken place.

It is of course not necessary to use quite unsymmetrical uni-directional valves, i. e. valves which allow the current to pass in a certain direction and block it in the opposite direction. Within the scope of the invention it is for instance possible to use a non-linear inductance element as shown in Fig. 5 in a connection according to Fig. 1. As a valve an inductance coil is used with an iron core, which gives a large inductance when it is non-saturated but a small inductance when it is saturated. With the current flowing in the normal direction the iron core will be kept saturated, but if the current tends to change its direction, the magnetization of the core must be reversed, which, if the core is sufficiently dimensioned, will take such a long time that it, in reality, means that the change of current is prevented, because the exciter then succeeds in taking up voltage in the

3

proper direction, before the current has time to change its direction. This means that the non-linear inductance has the same purpose as a valve element.

I claim as my invention:

1. Means for controlling the magnetization of a main machine, comprising an exciter provided with two excitation windings one of which is connected as a shunt winding to the brushes of said exciter, uni-directional valve means series connected with said shunt winding, and a regulator for controlling the excitation of said exciter, said regulator and the second excitation winding being connected in series with said valve means.

2. Means according to claim 1, in which said valve means is arranged as a rectifier bridge connection so that those terminals of the connection which are direct current terminals when the bridge is used as a rectifier, are connected in series with the shunt winding, and the two other terminals of the bridge are connected in series with the second excitation winding and the regulator.

3. Means according to claim 1, in which said valve means is arranged as a rectifier bridge connection so that those terminals of the connection which are direct current terminals when the bridge is used as a rectifier, are connected in series with the shunt winding and also with the second excitation winding and the regulator, and the

4

alternating current terminals of the bridge are connected to an alternating current voltage source.

4. Means according to claim 1, in which the said shunt winding has a number of turns at least equal to that of the said second excitation winding.

5. Means according to claim 1, comprising an impedance connected in parallel with the said second excitation winding.

6. Means for controlling the magnetization of a main machine, comprising an exciter provided with two excitation windings one of which is connected as a shunt winding to the brushes of said exciter, non-linear inductance means series connected with said shunt winding, and a regulator for controlling the excitation of said exciter, said regulator and the second excitation winding being connected in series with said inductance means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,966,558 O'Hagan July 17, 1934

FOREIGN PATENTS

360,740 Germany June 11, 1921