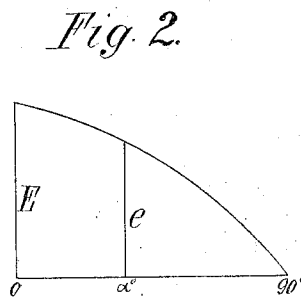
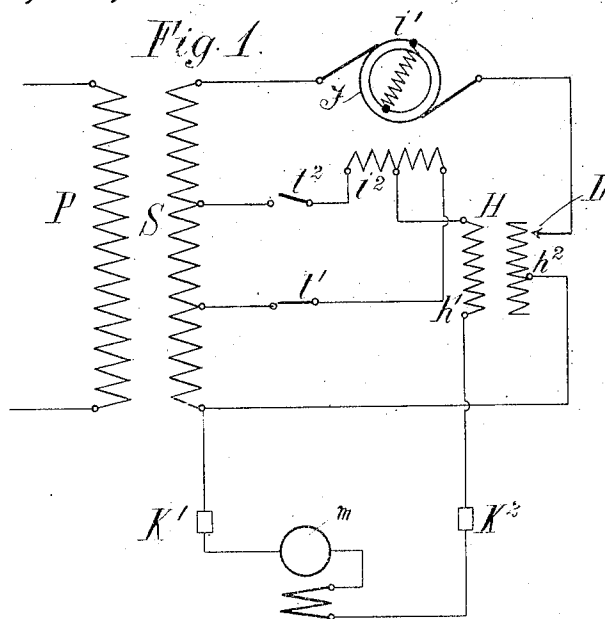


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 APPARATUS FOR REGULATING THE PRESSURE IN STEP TRANSFORMERS.
 APPLICATION FILED SEPT. 21, 1911.

1,053,110.

Patented Feb. 11, 1913.



WITNESSES

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APPARATUS FOR REGULATING THE PRESSURE IN STEP-TRANSFORMERS.

1,053,110.

Specification of Letters Patent.

Patented Feb. 11, 1913.

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To all whom it may concern:

Be it known that I, RUDOLF RICHTER, a subject of the German Emperor, residing at Grünau, Mark, Germany, have invented new and useful Improvements in Apparatus for Regulating the Pressure in Step-Transformers, of which the following is a specification.

This invention has reference to the regulation of pressure in step transformers whereby injurious sparking at the switching points, especially on opening the switches, is avoided.

It has heretofore been proposed to obtain a gradual change in pressure in step transformers while the several sections thereof are being switched on or off, by the employment of an induction regulator, the purpose being to prevent sparking at the switch points, but such result has been only imperfectly obtained since on a pressure step being switched on the respective branch current starts at its full force and on switching off is interrupted at its full force. There exists therefore the danger that the contacts will weld together especially when a contact drum is employed for switching. By the present invention this difficulty is obviated by an arrangement whereby the switches when opened or closed are free or nearly free from current.

In the drawing Figure 1 is a diagram illustrating the invention. Fig. 2 is a pressure diagram for the secondary winding of the induction regulator.

In Fig. 1 the primary and secondary windings of the main transformer are indicated at P and S respectively. For the sake of simplicity but two steps are shown in the secondary winding and the connecting points or contacts are designated, c' and c'' respectively, but it will of course be understood that more steps may be provided.

In the drawing, there is shown an induction regulator J needing no detailed description and the primary and secondary windings of the regulator are designated i' and i'' respectively while the primary winding i' is connected to the ends of the secondary winding S of the main transformer and the secondary winding i'' is connected by means of suitable conductors to points on the secondary winding S of the main transformer and also by a third conductor to one end of said secondary winding, the translation device m being included in this third conductor

and switches t' and t'' being included in the first conductors.

The main transformer having a primary winding P and a secondary winding S has the secondary winding connected at one end to one side of the primary winding i' , in this instance the rotatable member, of the induction regulator J, while the other end of the secondary is shown as connected to one terminal K' of a working circuit containing a translating device m typical of any means of utilizing the current in the working circuit. Connected to the other terminal K'' of the working circuit is one end of the primary winding h' of an auxiliary transformer H, the other end of the winding h' being connected to the midpoint of the winding i'' which latter at one end is connected to the switch t' and at the other end to the switch t'' . The transformer H has its secondary winding h'' connected between that end of the winding S, connected to the terminal K' and the winding i' , the said winding h'' having an adjustable connection L for regulation. It is to be understood that the transformer H acts as a booster with reference to the electromotive force impressed on the primary i' of the potential regulator J. Furthermore, it will be noted that by displacing the contact point L so as to place additional windings of the secondary in circuit the E. M. F. impressed in the primary of the potential regulator will be increased. By means of this arrangement, when it is found that the potential transformer J is ineffective to fully accomplish the purpose desired the contact L may be shifted to increase the effect. If a new step, say the second, of the main transformer is to be switched on, the pressure in the winding i'' is increased by displacing the point L sufficiently so that on the closing of the switch t'' little or no exchange of current takes place, and then the pressure in the winding i'' is reduced until the whole or the greater part of the working current flows through the switch t'' when the switch t' may be opened without injurious sparking. In Fig. 2, the effective pressure in the secondary winding of the induction regulator is plotted as a function of the adjustment of the induction regulator. The abscissæ indicate the angle inclosed by the axes of the windings. The maximum pressure E in the regulator is now chosen larger than the pressure in the

neighboring connections of the transformer which may have the value e . The load of both switches will be the same at the position of the induction regulator where the pressure in the secondary winding of the induction regulator is also equal to e , that is to say the switches in this position are equally loaded. To direct the current to switch t' , the pressure of the induction regulator is increased by reducing a . To direct current to switch t'' , the pressure is reduced by increasing a .

I claim:

1. In a device of the kind described, an induction regulator provided with primary and secondary windings a step transformer provided with a plurality of tapping points, means for connecting the secondary winding of the induction regulator to the tapping points of the step transformer, a working circuit including conductors arranged for conducting the working current through said secondary winding and means for varying the pressure in said secondary winding.

2. In a device of the kind described, an induction regulator provided with primary and secondary windings a step transformer provided with a plurality of tapping points, means for connecting the secondary winding of the induction regulator to the tapping points of the step transformer, a working circuit including conductors arranged for conducting the working current through said secondary winding, and means for regulating the pressure in the primary winding of the induction regulator.

3. In a device of the kind described, an induction regulator provided with primary and secondary windings a step transformer provided with a plurality of tapping points, means for connecting the secondary winding of the induction regulator to the tapping points of the step transformer, a working circuit including conductors arranged for conducting the working current through said secondary winding, and means for regulating the pressure in the primary winding of the induction regulator, said regulating means consisting of an auxiliary transformer provided with primary and secondary windings, said regulating means further including a shifting contact in elec-

trical connection with the primary winding of the induction regulator, said shifting contact being adapted for connection to different points of the secondary winding of the auxiliary transformer.

4. In a device of the kind described, an induction regulator provided with primary and secondary windings a step transformer provided with a plurality of tapping points, means for connecting the secondary winding of the induction regulator to the tapping points of the step transformer, a working circuit including conductors arranged for conducting the working current through said secondary winding, and means for regulating the pressure in the primary winding of the induction regulator, said regulating means consisting of an auxiliary transformer provided with primary and secondary windings, said regulating means further including a shifting contact in electrical connection with the primary winding of the induction regulator, said shifting contact being adapted for connection to different points of the secondary winding of the auxiliary transformer, the primary winding of said auxiliary transformer being connected in circuit with the secondary winding of the regulator and the working circuit.

5. In a device of the kind described, an induction regulator provided with primary and secondary windings a step transformer provided with a plurality of tapping points, means for connecting the secondary winding of the induction regulator to the tapping points of the step transformer, a working circuit including conductors arranged for conducting the working current through said secondary winding, means for varying the pressure in said secondary winding, the conditions of the induction regulator being chosen in such a manner, that the maximum pressure of the secondary winding is greater than the pressure of one transformer step.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RUDOLF RICHTER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.