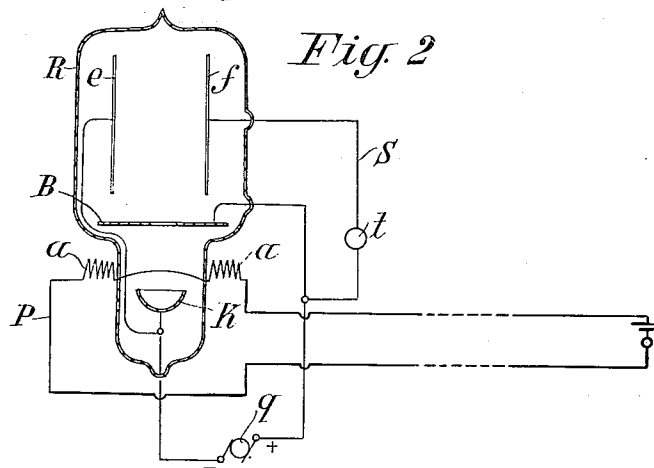
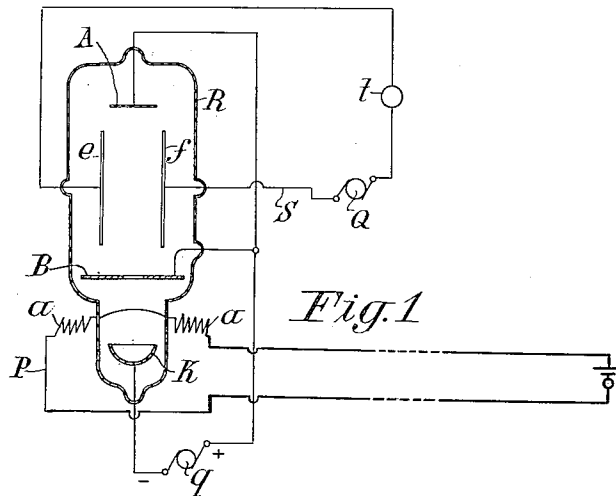


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RELAY FOR UNDULATORY CURRENTS.
APPLICATION FILED JAN. 30, 1911.

1,059,763.

Patented Apr. 22, 1913.



Witnesses:

[Signature]
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by *[Signature]*
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[Signature]

UNITED STATES PATENT OFFICE.

EUGEN REISZ, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE FIRM OF RELAIS-GESELLSCHAFT M. B. H., OF VIENNA, AUSTRIA-HUNGARY.

RELAY FOR UNDULATORY CURRENTS.

1,059,763.

Specification of Letters Patent.

Patented Apr. 22, 1913.

Application filed January 30, 1911. Serial No. 605,547.

To all whom it may concern:

Be it known that I, EUGEN REISZ, a subject of the Emperor of Austria-Hungary, residing at Vienna, Austria-Hungary, have invented certain new and useful Improvements in Relays for Undulatory Currents, of which the following is a specification.

This invention relates to relays for undulatory currents of that kind in which an exhausted discharge tube having a cathode and an anode is used, the proportional reproduction of the line currents being obtained by influencing the cathode rays emitted through an electromagnetic or electrostatic action of said line currents.

In the relays heretofore known the reproduction was obtained in the main current passing from the cathode to the anode itself, the passage of said main current being more or less varied by the action on the cathode rays.

It has been found that such relays could only be used within certain limits of current intensity, as the main current, when exceeding a certain value will cause an arc-like formation which can no longer be influenced whereby every reproduction is rendered impossible.

The object of the present invention is a relay in which the proportional reproduction can be effected practically at any current strength, without such limits whereby the ratio of reproduction *i. e.* the ratio between the undulating line currents to be reinforced and the main current reproducing the undulations can be greatly increased, which will result in a greater efficiency and a better working as well as in an enlargement of the sphere of application of the relay.

According to this invention the main current does not pass between the cathode and the anode of a discharge tube, but between two plates or other suitable electrodes which are suitably shaped so as to permit no arc formation. It is a well known fact that the passage of current between such electrodes in a discharge tube depends upon the ionization of the gaseous medium in the tube; now this invention provides a suitable ionizer, for example, cathode rays, light, Rontgen rays and the like, which is in-

fluenced by the line currents and thereby more or less ionizes or alters the conductivity of the gaseous medium between the electrodes, thus causing corresponding variations in the circuit embodying said electrodes.

It is obvious that the ionizer circuit being external to the circuit of the electrodes, every current strength in the circuit of the electrodes may be used, the said electrodes when suitably shaped preventing an arc formation between them in every case. On the other hand, the ionizer, when embodied itself in the discharge tube, as for example in the case of cathode or Rontgen rays being used as such, may invariably be used with the same current intensity as this latter is quite immaterial with respect to the ratio of reproduction and need only be adjusted with respect to the evacuation of the tube and the distance of the anode.

In the accompanying drawing, the improved relay is shown in two forms; Figure 1 shows an arrangement with a separate source of direct current for the circuit containing the electrodes of the main current and Fig. 2 an arrangement in which the electric generator for producing the cathode rays, which effect the ionization, is also used for the circuit of the electrodes of the secondary or main circuit.

The primary circuit P, in which the variations of electric current to be reinforced occur, contains electromagnet bobbins *a* and is so arranged that these variations of current control the cathode rays produced in a suitably exhausted discharge tube R and acting as an ionizer in the manner herein- after described.

In the arrangement in Fig. 1 the cathode rays are emitted from a cathode *e. g.* a concave mirror cathode K and the latter together with the corresponding anode A is connected in the circuit of a source *g* of direct current. In the discharge tube R are moreover arranged two flat electrodes *e* and *f* in such a manner that the space between these electrodes lies in the path of the cathode rays. The flat electrodes are arranged in the secondary circuit S containing the source Q of direct current, in which the reinforced variations of current occur

and which contains an apparatus *t* (a telephone, arc lamp, etc.) to be acted upon by such variations of current.

In the path of the cathode rays is arranged a screen or diaphragm B which screens these cathode rays and when it is made of conducting material, is connected with the positive pole of the source *q* of direct current. If the screen is made of an insulating material an auxiliary anode effects the conduction of the current. The material and temperature of the cathode K (preferably incandescent metallic oxide) and the gas in the discharge tube are preferably so chosen that the emission of cathode rays takes place with even a comparatively low voltage of the source *q* of current. The rays emitted at such low voltages have a great capacity for being deflected magnetically, whereby increased sensitiveness of the relay is obtained. When the emission of cathode rays has entirely ceased, no current flows in the secondary circuit S between the electrodes *e* and *f* since the voltage applied to these electrodes is not sufficient to effect the requisite impact of the ions for producing conduction. If, on the other hand, the cathode rays emitted by the cathode K strike the gaseous space between the electrodes *e* and *f*, by reason of the splitting of the gas molecules (ionization) caused thereby, current will flow in the secondary circuit S so long as the ionizer (cathode rays) acts on the gaseous space between *e* and *f*.

From the above it follows that, by means of the undulatory currents flowing in the deflecting coils *a*, *i. e.* by the magnetic deflection of the cathode rays caused by these coils, the conductivity (ionization) of the gaseous space between *e* and *f* is altered. This alteration obviously takes place with the same frequency and wave-form as that of the variations of current in the primary circuit P.

In order to enable the maximum intensity of the current to be obtained with the available ionization, the number, size and distance apart of the electrodes are made such that recombining of the split molecules is prevented.

A simplified scheme of connections is shown in Fig. 2, in which the source *q* of current for emitting the cathode rays is also employed for the secondary electrodes *e* and *f*. In this arrangement one electrode *e* is connected to the cathode conductor, the other electrode being connected to the conductor extending from the source *q* of electric current to the screen B. It should further be mentioned that the variations of current reinforced by the relay can be caused to act on a second similar relay, whereby a further multiplication of the primary current-waves can be obtained.

The advantage of the arrangement form-

ing the subject of the present invention over the already known cathode-ray relays consists in that, in this relay, the ionizer controlled by the variations of current to be reinforced, releases any desired amount of energy, *i. e.* a current of any desired strength can be caused to pass between the secondary electrodes, in which operation the amount of energy consumed in the ionizer itself can be made comparatively small. This result cannot be attained with the relays heretofore known for the reason that in these relays the cathode rays do not act as an ionizer for a second circuit, but themselves form a constituent part of the circuit for the reinforced current itself, in which arrangement moreover the high vacuum there employed does not permit great intensities of currents or large energies in the form of cathode rays to be employed.

My improved relay for undulatory currents can be used for various purposes, *e. g.* for increasing the strength of sound, as a relay in overhead wire and cable telegraphy for short and long distance working, also in wireless telegraphy and telephony, also as auxiliary apparatus for telegraphones and for the electric transmission of pictures and the like.

Claims.

1. A relay for undulatory currents comprising a discharge tube containing a gaseous medium, an electric circuit embodying electrodes positioned in said medium, means external to said circuit for altering the electric conductivity of the space between the electrodes, and means acting upon the first named means by the variations of the current to be reinforced.

2. A relay for undulatory currents comprising a discharge tube containing a gaseous medium, an electric circuit embodying electrodes positioned in said medium, an ionizer for altering the electric conductivity in the space between the electrodes, said ionizer being external to the circuit of the electrodes and controlled by the undulatory currents to be reinforced to produce a variable ionization in the space between the electrodes.

3. A relay for undulatory currents comprising a discharge tube containing a gaseous medium, an electric circuit embodying electrodes positioned in said medium, an ionizer external to said circuit for ionizing the space between the electrodes, and electromagnetic means for acting upon said ionizer by the variations of the undulatory currents to be reinforced.

4. A relay for undulatory currents comprising an electric circuit embodying electrodes and a cathode whose rays act as an ionizer for ionizing the space between said electrodes, the circuit of said ionizer being independent of the circuit of the electrodes

and controlled by the variations of current to be reinforced, said ionizer effecting an alteration of a gas between the electrodes and producing reinforced variations of current of like frequency and wave form.

5 5. A relay of the class specified, comprising a suitably exhausted discharge tube, a cathode therein, the rays of the cathode acting as an ionizer, secondary electrodes disposed in the tube and included in an electric circuit, an apertured screen between the cathode and electrodes, the space between the electrodes lying in the path of the cathode rays which are produced by a source
10 of electric current and pass through the screen, and electrical generating means in circuit with the cathode and electrodes.

6. A relay of the class specified, comprising a discharge tube suitably exhausted and
20 having a cathode and secondary electrodes arranged therein, the cathode rays acting as an ionizer and the space between the electrodes lying in the path of the cathode rays, and a source of direct current connected to the cathode and electrodes and serving for
25 the emission of the cathode rays and also simultaneously for supplying the secondary electrodes, the circuit of the cathode being independent of the circuit of the electrodes.

30 7. A relay for undulatory currents comprising an evacuated tube containing a gaseous medium, an electric circuit embodying

electrodes positioned in said medium, a cathode embodied in a circuit independent of the circuit of the electrodes whose rays
35 act as a ionizer operatively associated with said electrodes and controlled by the variations of currents to be reinforced, said ionizer effecting an alteration of the gas between the electrodes and producing reinforced variations of current of like frequency and wave form, and means for deflecting the cathode rays.

8. A relay for undulatory currents comprising an evacuated tube containing a gaseous medium, an electric circuit embodying
45 electrodes positioned in said medium, a cathode embodied in a circuit independent of the circuit of the electrodes whose rays act as an ionizer operatively associated with said electrodes and controlled by the variations of currents to be reinforced, said ionizer effecting an alteration of the gas between the electrodes and producing reinforced variations of current of like frequency and wave form, and electromagnetic
55 means for deflecting the cathode rays.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EUGEN REISZ.

Witnesses:

JOSEF RUBASCH,
AUGUST FUGGER.