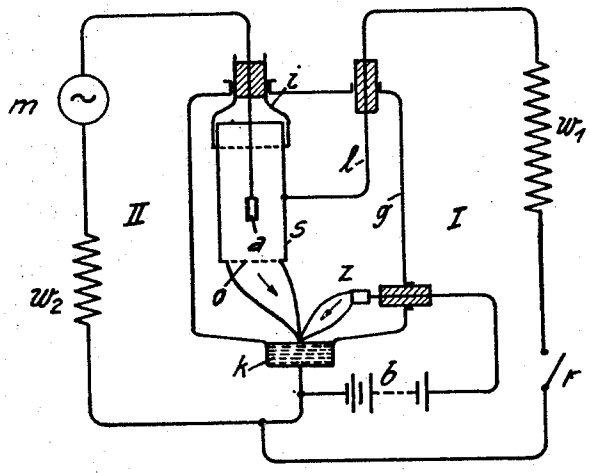
Sept. 1, 1925. 1,551,970

B. B. SCHÄFER

HEAVY CURRENT RELAY

Filed July 14, 1920



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UNITED STATES PATENT OFFICE.

BÉLA B. SCHÄFER, OF BADEN, SWITZERLAND, ASSIGNOR TO GLEICHRICHTER-AKTIEN-GESELLSCHAFT, OF GLARUS, SWITZERLAND.

HEAVY-CURRENT RELAY.

Application filed July 14, 1920. Serial No. 396,301.

To all whom it may concern:

Be it known that I, BÉLA BENÖ SCHÄFER, a citizen of the German Realm, residing at No. 39 Schartenstrasse, Baden, Switzerland, have invented certain new and useful Improvements in Heavy-Current Relays (for which I have filed an application in Germany on May 8, 1919), of which the following is a specification.

This invention has for its object to provide an improved heavy current relay for the purpose of switching in and out alternating currents of any strength with an exceedingly small controlling energy. This may be attained by surrounding the anode of a metal vapour rectifier with a metal casing which is led in an electrically conducting manner out of the vacuum vessel and connecting the negative potential to the metallic shield covering the anode. The simplest way of effecting the charging is by means of a negative potential, the covering of the anode being connected to the cathode through a high resistance. This construction allows of controlling any desired large quantities of energy with extremely small charging potentials.

The drawing shows an example of an arrangement of connections for carrying out the invention.

In the drawing, g represents a vacuum vessel with the electrodes a and k passing thereinto in a gas-tight manner. The anode a consists of any solid conducting material, for instance iron or graphite, and is insulated from the casing by means of an insulator i. The cathode k consists of a liquid metal usually mercury. The anode a is provided with a covering s of sheet iron at the mouth of which there is located a sieve-like closing device o. The covering s is connected through a conductor l, resistance w_1 and switch r to the cathode, and constitutes the controlling circuit I.

A separate source of current b is designed by means of the igniting anode z, to maintain an auxiliary light arc serving for the permanent excitation of the cathode. The source of alternating current m constitutes together with the resistance w_2, anode a and cathode k, the circuit II which is to be controlled.

When the switch r is open and the auxiliary light arc between z and k is ignited, then there will be produced in the usual manner between a and k likewise a light arc which is fed with uni-directional current impulses.

When the switch r is closed, the flow of current in the circuit II is instantaneously stopped, it being immaterial whether weak currents or currents of any desired strength have been passed through.

The operation of the improved apparatus is based on the physical phenomenon that the electrical field generated by the negative screen potential stops almost instantaneously any passage of ions to the anode whereby the said anode is rendered inactive. In the case of an alternating current system having a periodicity of 50, the complete stoppage of the current will therefore take place at latest on the expiration of 1/100 second after the actuation of the switch r.

The resistance w_2 may be replaced by any desired actuating apparatuses, and any mechanical operation may be controlled by this means. The resistance w_1 in the circuit I may assume extraordinarily large values without detriment to the safety of working of the installation.

The sieve o may consist also of perforated sheet metal, or it may be dispensed with entirely. The source of current m may also be replaced by a source of direct current, but in such a case the current strengths that are permissible in the circuit H, are considerably smaller than in the case of alternating current, in order to compel an extinguishing of the light arc a—k with the help of the screen potential.

What I claim is:—

1. A method of utilizing the vacuum arc between the anode and the cathode of a heavy current metal vapour rectifier as a heavy current circuit breaker which con-

sists in surrounding the anode of the rectifier with a conductive shield and applying a negative potential to said shield in order to break the circuit containing the arc.

2. A method of utilizing the vacuum arc between the anode and the cathode of a heavy current metal vapour rectifier as a heavy current circuit breaker which consists in surrounding the anode of the rectifier with a conductive perforated sieve-like shield and applying a negative potential to said shield in order to break the circuit containing the arc.

In testimony whereof I have signed my name to this specification.

BÉLA B. SCHÄFER.