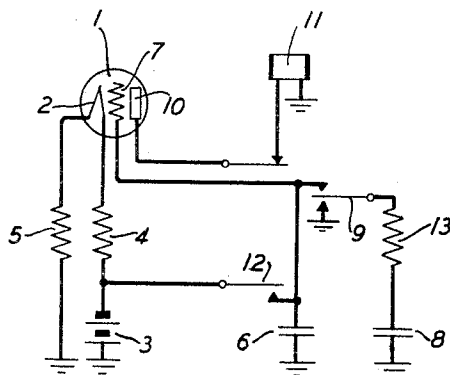


Dec. 3, 1935.

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ELECTRICAL COUNTING SYSTEM
Filed Jan. 20, 1934

2,023,010



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2,023,010

ELECTRICAL COUNTING SYSTEM

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Application January 20, 1934, Serial No. 707,473

7 Claims. (Cl. 179—16)

This invention relates to electrical counting systems and its object is to secure improvements in counting and denoting electrical impulses.

In the applicant's copending application Serial No. 707,471, filed under even date with the present application, now Patent No. 2,002,219, granted May 21, 1935, a system has been provided for counting and denoting the number of operations of contacts, the arrangement being such that a neon lamp or similar discharge device is included in the circuit in which a first condenser is charged from a source of energy under control of contacts and then a second condenser is charged from the first condenser under control of said contacts. This operation is repeated until the second condenser has accumulated a charge equal to the breakdown potential of the discharge device in series with the second condenser, the breakdown of the device indicating that the contacts have operated a certain number of times.

It is a feature of the present invention to count or denote by somewhat similar circuit arrangements the number of operations of contacts. The arrangement in the present case is such that a discharge device of the three-element type is employed in circuits with two condensers and control contacts, the number of operations of which are to be counted. In this case the filament is maintained at a certain potential and a first condenser included in the grid circuit is given a definite charge to create a potential on the grid negative in respect to the filament potential. This condenser is then discharged in small increments through a second condenser which is alternately charged from the first condenser and discharged by the repeated operations of said control contacts. This discharging of the first condenser is continued making the grid potential less and less negative with respect to the filament potential until a discharge path is provided through the filament and plate circuit of the tube to operate a relay to denote the number of operations of said control contacts.

The invention is illustrated in the accompanying drawing in which a tube 1 of the thyatron type or similar discharge device is employed. The filament 2 is normally maintained at a certain potential by a potentiometer circuit including battery 3, resistance 4, filament 2, resistance 5 to ground. The condenser 6 is normally connected between the grid 7 and ground. One side of the condenser 8 is connected to ground and the other side through a resistance to contacts 9 which may connect the condenser 8 alternately to the grid 7, and one side of condenser 6 or directly

to ground. The plate circuit extends from battery 3, resistance 4, filament 2, a path across from the filament 2 to the plate 10 and a circuit through relay 11 to ground.

The operation of this system is as follows: The condenser 6 is first momentarily given a charge from battery 3 through a key 12, condenser 6 to ground which raises the potential on the grid 7 to a point negative in respect to the potential on the filament 2, thus preventing current passing through the plate circuit when contact 12 is closed. When 12 is closed then the contacts 9 are operated to close connections alternately from the condenser 8 to condenser 6 or from condenser 8 to ground. When the connection through the contacts 9 is closed between the condensers 6 and 8 the condenser 8 assumes an increment of the potential on condenser 6 and when the contacts 9 are closed to ground the condenser 8 is discharged. These operations are repeated until the potential on condenser 6 has been sufficiently reduced to cause the potential on grid 7 to become of such critical value that it will permit the tube to break down. This critical value may, depending on the breakdown characteristics of the tube, be such that the potential difference between the grid and filament is but slight. A preferred condition is that in which the potential on the grid is still negative in respect to the potential on the filament 2. Current will then flow through the plate circuit to operate the relay 11. The operation of this relay denotes the number of operations of the contacts 9. This number depends on the ratio between the capacities of condensers 8 and 6, the normal potential on the filament and breakdown potential characteristics of the tube.

The resistance 13 is inserted in the circuit for the condenser 8 to safeguard against the premature breakdown of the tube 1. The potential drop across the resistance 13, due to the discharge current from condenser 6 when contacts 9 are closed to connect the condensers, prevents such a premature breakdown as it prevents the grid from becoming more positive than the upper plate of condenser 6.

What is claimed is:

1. In combination, a gaseous conduction device having a filament, a grid and a plate, contacts operative at intervals, means for establishing a certain potential on said grid with respect to the filament potential, and means for causing the breakdown of said device by reducing the potential difference between said elements controlled

by the operation of said contacts a definite number of times.

2. In combination, a gaseous conduction device having a filament, a grid and a plate, a grid circuit to ground including a condenser, a filament circuit to establish a certain potential on the filament, means for charging said condenser to establish a potential on the grid above the breakdown potential of the device, a plate circuit, means for reducing the potential difference between the filament and grid to cause the breakdown of the device through the plate circuit including the gradual reducing of the potential on the condenser and grid controlled by the operation of said contacts a definite number of times.

3. In combination, a gaseous conduction device having a filament, a grid and a plate, a grid circuit to ground including a condenser, a filament circuit to establish a certain potential on the filament, means for charging said condenser to establish a potential on the grid above the breakdown potential of the device, a plate circuit, another circuit including a condenser, contacts operated at intervals, circuit means for alternately connecting said second condenser to said first condenser and to the grid by operations of said contacts, said circuit means being so arranged that a definite number of operations of said contacts causes said first condenser to be discharged to a point where the potential difference between the filament and the grid causes the device to break down to provide a path for current through the plate circuit.

4. In combination, a first condenser, a second condenser, means for normally charging said first condenser to a certain definite potential and means for discharging said first condenser by the

alternate charging and discharging of said second condenser.

5. In combination, a first condenser, a second condenser, means for normally charging said first condenser to a certain definite potential, means for discharging said first condenser in steps by the alternate charging and discharging of said second condenser, and means including a discharge path operating when a charge of said first condenser has been reduced to a definite value.

6. A gaseous conduction device having an anode, a cathode and a grid element, means for normally maintaining a certain potential on said cathode, means for placing a certain potential on said grid element negative with respect to the cathode potential, means for decreasing the potential on said grid element by definite decrements, and means operated when the potential on the grid element is of a certain negative value close to but greater than the negative value of the potential on said cathode to provide a discharge path across the cathode and anode of said device.

7. In combination, a gaseous conduction device having an anode, a cathode and a grid element, an anode circuit, a cathode circuit and a grid circuit, means for maintaining said cathode at a certain potential in its circuit, means for momentarily placing said grid in its circuit at a certain other potential negative to the potential of said cathode, means for changing the potential on said grid by definite decrements until the potential on said grid has decreased almost to the negative potential on said cathode to provide a path across the cathode and anode through the anode circuit.

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