Sept. 10, 1935. W. F. COTTER ET AL 2,013,878

ELECTRIC CONVERTER

Filed May 18, 1934

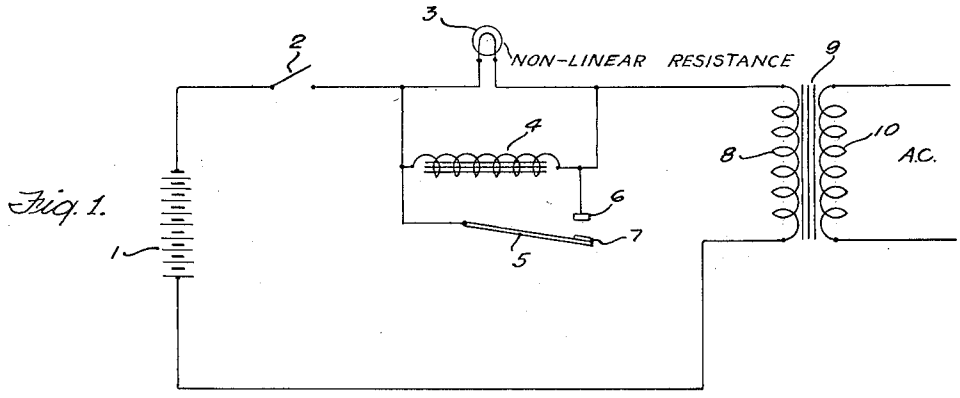


Fig. 1.

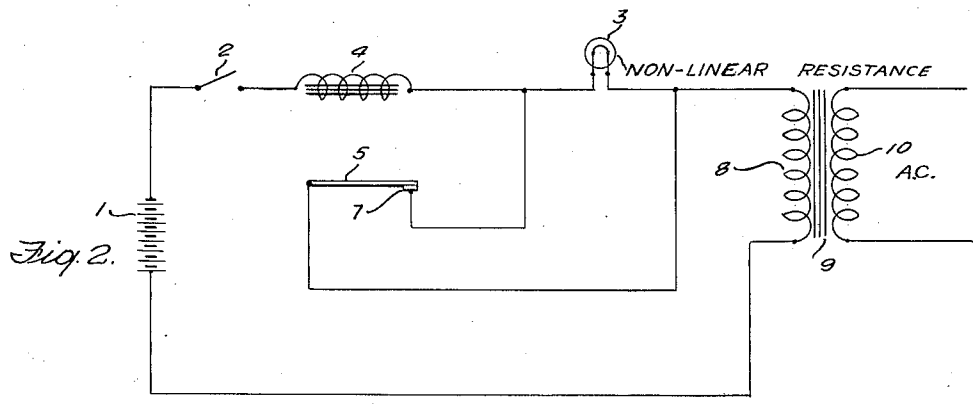


Fig. 2.

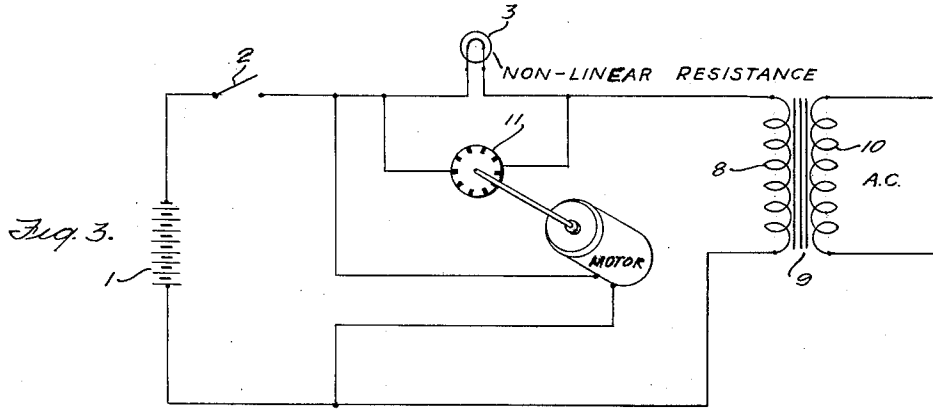


Fig. 3.

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Patented Sept. 10, 1935 2,013,878

UNITED STATES PATENT OFFICE

2,013,878

ELECTRIC CONVERTER

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Application May 18, 1934, Serial No. 726,234

8 Claims. (Cl. 175—363)

This invention relates to power supply systems whereby D. C. is converted into A. C., and more specifically to such a system in which the D. C. is transmitted in periodic pulses through a transformer winding. The alternating output is developed across a secondary winding of the transformer and is available for any desired use. Such devices in the past have had the disadvantages of excessive arcing and burning of contacts and of sticking contacts; and have given extreme difficulties in filtering when employed for such uses as radio power supply. This difficulty is caused by the radio frequency disturbances due to the arcing across the contacts. The invention herein disclosed contemplates the provision of a non-linear or variable resistance to be connected into circuit, and causing the current to be modulated by means of this resistance. By this method the above-mentioned difficulties with contact points and radio filtering are greatly lessened.

One object of the invention is to provide an improved D. C. to A. C. converter.

Another object is to provide a converter in which arcing across the contact points is lessened.

A further object is to provide a converter which requires a minimum of filtering for radio use.

Other objects and advantages will in part be obvious and in part be specifically set forth in the following specification and claims in which:

Fig. 1 is a diagrammatic representation of the invention with the associated circuits and elements; Fig. 2 is a modification of the circuit presented in Fig. 1, showing the relay coil series connected in the circuit; and Fig. 3 is another modification of the basic circuit presented in Fig. 1, showing a motor driven commutator interrupter in the circuit.

Referring to Fig. 1 in more detail, the numeral 1 indicates a battery or any suitable source of direct current. Connected to one terminal of the battery through switch 2 is a non-linear resistance 3, shown and described in its preferred embodiment as an incandescent lamp having a positive temperature coefficient. However, it is not intended to so limit the invention, as a resistance having a negative temperature coefficient may be employed as will later be described. A relay having a coil 4 and an armature 5 is connected between the battery 1 and the resistance lamp 3 in such a manner that the coil 4 is shunted across the lamp and the armature shunts the coil 4 when sufficient operating current is flowing in the circuit. A contact point 6, and an armature contact point 7 are provided on the relay structure. The transformer 9 has one end of a primary winding 8 connected to the resistance lamp 3 and the relay coil 4. The other end of winding 8 leads to the remaining terminal of battery 1. The A. C. output of the device is developed across winding 10, and may be utilized for any suitable purpose.

The operation of the device is as follows. When the switch 2 is closed, current starts to flow around the circuit through the non-linear resistance of lamp 3 and relay coil 4. As the lamp heats up both its resistance and the voltage drop across its terminals increase in value. An increased portion of the current flowing in the circuit including the transformer winding 8 is diverted through relay coil 4. The rate at which this current increases depends upon the inductance and resistance of coil 4. When sufficient actuating current flows through coil 4, the armature 5 is attracted and contacts 6 and 7 are closed. A shunt circuit is thus established which bypasses both the lamp 3 and the relay coil 4. As soon as the current in coil 4 has decreased to a point where the armature 5 is no longer attracted, the armature drops, breaking the shunt and replacing lamp 3 in the circuit. The process repeats itself at a frequency depending upon the inductance and resistance of coil 4, the mechanical inertia of the armature 5, the thermal inertia of resistance lamp 3, and the inductance and resistance of winding 8. Arcing across the relay contact points is minimized, since at the instant of circuit opening the comparatively low resistance of the lamp is always shunted across the contacts. The relay points are thus maintained free from burning, pitting and poor contact, and the trouble and expense of frequent inspection and replacement is avoided. The radio frequency disturbances of heavy sparking are likewise minimized and such disturbances as are present may readily be suppressed by simple filtering measures well known to the radio art.

While the preferred embodiment of the device employs a resistance having a positive temperature coefficient and the theory of operation is presented in terms of such a resistance, a resistance having a negative temperature coefficient may be employed to cause the desired current pulsations in the circuit. In case the latter type of resistance is used, the relay 4 as shown in Fig. 1 is so arranged that the dropping of armature 5 closes the shunt circuit around the resistance. The resistance and inductance of the relay coil 4 may readily be altered to suit the requirements imposed by a resistance 3 having a negative temperature coefficient. In this latter instance the device will modulate "upward" instead of "downward" as occurs in the preferred embodiment;

however in each instance alternating current is produced across the secondary winding 10. A motor driven resistance of the continuously variable type may also be used in the circuit. The essence of the invention is the rapid insertion and removal of resistance in the circuit to produce a pulsating direct current and this may be accomplished in many ways.

The modification shown in Fig. 2 differs from Fig. 1 only with respect to the series connection of the relay coil 4 in place of the shunt connection illustrated in Fig. 1, and in the feature of the armature 5 being arranged to open the lamp shunting circuit instead of closing it. The armature 5 shunts the resistance lamp 3 out of the circuit periodically in response to the instantaneous resistance developed across the lamp 3 and produces the same fluctuating resultant current as the circuit of Fig. 1.

Fig. 3 is another modification of the circuit of Fig. 1, the difference being that a rotating commutator switch 11 replaces the shunt connected relay shown in Fig. 1. The commutator speed is proportioned to the thermal properties of the resistance lamp 3 to establish the shunt circuit around the lamp when its resistance has reached the highest point. The lamp 3 cools during the duration of the shunt period and when the shunt is broken, the resistance of the lamp has fallen to a much lower value. When the lamp is replaced in the circuit it starts to heat and its resistance rises again to peak value, whereupon the cycle of operation is repeated. The result of these operations is to produce a fluctuating current through the transformer primary 8 which appears as A. C. across the secondary 10.

It will be obvious that one of the herein disclosed current modulators could be employed across each side of a split primary transformer to produce A. C. on a secondary winding thereof. Many other changes and modifications may be made by one skilled in the art without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. In a device for converting direct current to alternating current, a source of direct current, a circuit connected to said source and including a transformer winding, a non-linear resistance connected in said circuit, and means for shunting said resistance at intervals.

2. In a device for converting direct current to alternating current, a source of direct current, a circuit connected to said source and including a transformer winding, a non-linear resistance connected in said circuit, and circuit interrupting means for shunting said resistance at intervals.

3. In a device for converting direct current to alternating current, a source of direct current, a circuit connected to said source and including a transformer winding, a non-linear resistance connected in said circuit, and a relay for shunting said resistance at intervals.

4. In a device for converting direct current to alternating current, a direct current source, a circuit connected to said source and including a transformer winding, a non-linear resistance connected in said circuit, a relay winding connected in parallel to said resistance, and a circuit controlled by said relay, whereby said resistance may be bypassed.

5. In a device for converting direct current to alternating current, a direct current source, a circuit connected to said source and including a transformer winding, a non-linear resistance included in said circuit, means for bypassing said resistance when it reaches its highest value, and means for reinserting said resistance into the circuit when it has fallen to a lower value.

6. In a device for converting direct current to alternating current, a direct current source, a circuit connected to said source and including a transformer winding, means for producing a pulsating current in said circuit, said means comprising a resistance in said circuit, said resistance varying between limits, and means for operating said resistance between any two points within said limits.

7. In a device for converting direct current to alternating current, a direct current source, a circuit connected to said soruce and including a transformer winding, means for producing a pulsating current in said circuit, said means comprising a resistance in said circuit, and switch means for periodically bypassing said resistance.

8. In a device for converting direct current to alternating current, a direct current source, a circuit connected to said source and including a transformer winding, means for producing a pulsating current in said circuit, said means comprising a resistance in said circuit, said resistance varying in value between limits and means for including said resistance in said circuit when it is at a low value and for bypassing said resistance when it is at a higher value.

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