

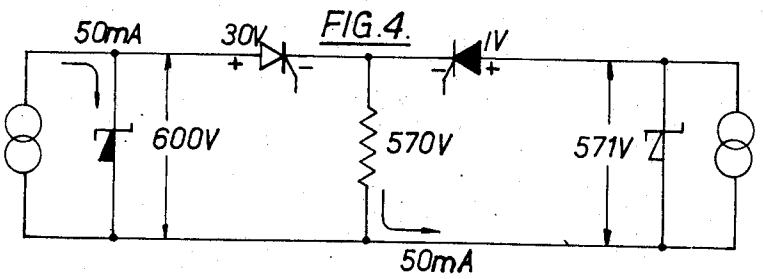
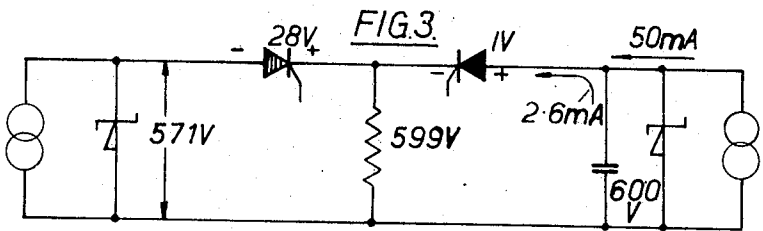
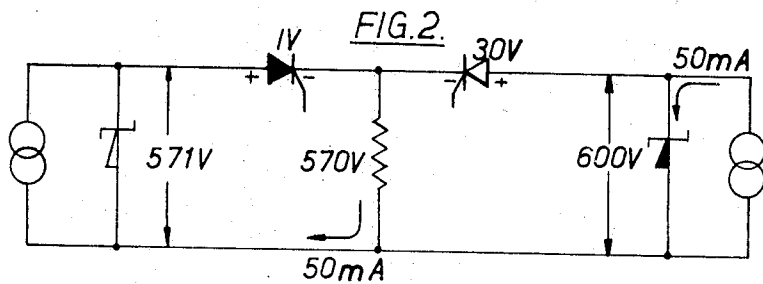
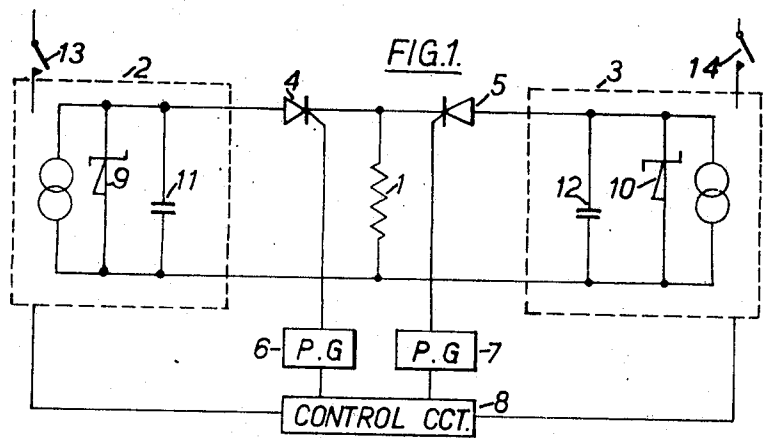
Feb. 3, 1970

B. W. RICHARDS

3,493,777

NO BREAK ELECTRICAL CHANGEOVER

Filed Oct. 17, 1968



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3,493,777

NO BREAK ELECTRICAL CHANGEOVER

Brian William Richards, Wickford, Essex, England, assignor to International Standard Electric Corporation, New York, N.Y., a corporation of Delaware

Filed Oct. 17, 1968, Ser. No. 768,350

Claims priority, application Great Britain, Oct. 19, 1967, 47,643/67

Int. Cl. H02j 1/04

U.S. Cl. 307—60

4 Claims

ABSTRACT OF THE DISCLOSURE

A very simple circuit in which each constant current source is connected to the load via a silicon controlled rectifier and has its no load voltage limited to a value slightly in excess of that existing normally across load. A capacitor is connected across each source, so that at the instant of changeover the connected source behaves as a constant voltage generator which back biases and extinguishes the other silicon controlled rectifier.

This invention relates to a no-break changeover circuit for power supply units and in particular to circuits for units supplying a constant current to a load.

The changeover from a working to a standby power supply unit, each of which is to maintain a constant voltage across a load, is relatively simple in that the standby unit is simply connected in parallel with the working unit and the latter is subsequently switched off. Thus during the changeover period both units share the load current.

In the case when the power units have to feed a constant current into the load the above simple solution is not practicable as, unless special precautions are taken, instability will result when two constant current generators are connected in parallel and must share the current.

The precautions which must be taken to avoid instability must air at effecting the changeover in the shortest possible time and to convert during the changeover period the characteristic of the unit which is to feed the load from a constant current to a constant voltage type.

According to the invention there is provided a circuit to change over from a first constant current source feeding a load to a second constant current source comprising silicon controlled rectifier switching means connected between each source and the load, means connected across the output circuit of each source to prevent the voltage to exceed a specified value V_o when the switching means of a source is non-conductive wherein the voltage V_o exceeds the voltage V_L developed across the load by the said constant current, a capacitor connected across each source to supply extra current to the load during changeover from one source to the other, and means for "closing" either of said switching means wherein the "closing" of one switching means automatically "opens" the second.

The invention will now be described with reference to the accompanying drawings, in which:

FIG. 1 shows in schematic form an embodiment of a circuit according to the invention, and

FIGS. 2 to 4 are used for the explanation of the invention.

In FIG. 1 the load which is to be supplied with constant direct current I is represented by resistor 1. The two sources, one of which is provided as a standby are indicated by 2 and 3. Each of these sources is connected to the load via a silicon controlled rectifier (SCR) 4, 5 used as electronic switches. Each SCR can be "closed" by applying to its control electrode a pulse from a generator 6, 7. A control circuit 8 is provided to initiate a changeover from one of the sources to the other either manually or automatically.

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Each source has connected across its output terminals a Zener diode 9, 10 and a capacitor 11, 12.

The operation of the changeover circuit will now be described by reference to a specific example.

Assume that the load is to be supplied with a constant current I of 50 ma. and that under normal operating conditions this current maintains a voltage V_L of 570 v. across the load. The Zener diodes 9 and 10 are selected to maintain across the terminals of each source the voltage V_o which is slightly higher than V_L , say 600 volts when a source is not supplying current to the load. Thus when for example source 2 is switched on by closing switch 13 current I of 50 ma. will flow into diode 9 and charge capacitor 11 to 600 volts. To connect source 2 to the load a pulse from generator 6 is applied to the control electrode of silicon controlled rectifier 4 which becomes conductive. Current I will now flow into the load and maintain 570 volts across it. The Zener diode 9 will cease to conduct.

To effect a changeover from source 2 to source 3, the latter is first switched on by closing switch 14. Capacitor 12 will charge up to 600 volts. We now have the condition as depicted in FIG. 2. Rectifier 5 is forward biased by 600—570=30 volts but is not yet conducting. When SRC 5 is triggered manually or automatically by the pulse generator it will become conducting. Capacitor 12 will start discharging via switch 5 through the load, the voltage across the latter increasing momentarily to 599 volts. SRC 4 is back biased by the voltage difference

$$599-571=28$$

volts. This situation is shown in FIG. 3 SRC 4 will become non-conducting thereby disconnecting source 2 from the load. As capacitor 12 gradually discharges through the load its voltage will drop to 570 volts and Zener diode of source 3 will cease to conduct. At the same time as a result of SRC becoming non-conducting capacitor 11 of source 2 will charge to 600 volts. We now have conditions as shown in FIG. 4 which is the reverse of that shown in FIG. 2.

From the above description it is apparent that the operation of the changeover circuit depends on the ability of each constant current source to provide for a short time a current in excess of the rated value. In other words the operation depends on the fact that during the switchover the standby unit behaves as if it had a constant voltage characteristic. This extra current is supplied by the capacitor connected across each of the sources. The value of this capacitor must be made just sufficiently large to maintain the back biasing potential across the SRC to be switched off for at least 20 microseconds, which is the hole storage time of the SCR.

As stated previously the control unit 8 is arranged so that the pulse generators 6 and 7 can be actuated manually or automatically for which purpose the control unit is connected to suitable alarm devices associated with each source. Thus in the event that the current supplied to the load by one of the sources changes by more than a permitted amount the pulse generator of the other source is actuated.

I claim:

1. A circuit to change over from a first constant current source feeding a load to a second constant current source comprising silicon controlled rectifier switching means connected between each source and the load, means connected across the output circuit of each source to prevent the voltage to exceed a specified value V_o when the switching means of a source is non-conductive wherein the voltage V_o exceeds the voltage V_L developed across the load by the said constant current, a capacitor con-

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nected across each source to supply extra current to the load during changeover from one source to the other, and means for "closing" either of said switching means wherein the "closing" of one switching means automatically "opens" the second.

2. A circuit as claimed in claim 1 in which the means for "closing" a silicon controlled rectifier switching means is a pulse generator wherein the momentary increase of voltage across the load from value V_L to value V_o when one source is connected to the load back biases the "closed" switch of the other source by the amount $V_o - V_L$ and "opens" it.

3. A circuit as claimed in claim 2 in which a capacitor is connected across the output circuit of each source to maintain the voltage of a source after connecting it to the load at value V_o for a time sufficiently long to "open" the other switching means.

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4. A circuit as claimed in claim 3 further comprising means to detect a fault condition in either source and means to actuate the pulse generator to close the switching means of the other source.

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ROBERT K. SCHAEFER, Primary Examiner

H. J. HOHAUSER, Assistant Examiner

U.S. Cl. X.R.

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