United States Patent Office

3,530,310

Patented Sept. 22, 1970

3,530,310
TOUCH ACTIVATED DC SWITCH AND PROGRAMMER ARRAY

Alexander Michael Adelson, Elmsford, and Jerome Swartz, Elmhurst, N.Y., assignors, by mesne assignments, to Hall-Barkan Instruments, Inc., Tuckahoe, N.Y., a corporation of New York

Filed Oct. 28, 1966, Ser. No. 594,327
The portion of the term of the patent subsequent to Feb. 3, 1987, has been disclaimed
Int. Cl. H03k *17/00*
U.S. Cl. 307—252 9 Claims

ABSTRACT OF THE DISCLOSURE

A solid state momentary switch device which responds to the touch of the human body and includes an SCR whose power terminals are connected in series with a source of electric power and an electric load. Also included in the series circuit is a time constant arrangement in the form of a current flow control means which automatically varies its impedance between a high and a low impedance state. This arrangement consists of a resistor large enough to reduce the current flow to below that required for maintaining discharge through the SCR and a capacitor which presents a low initial impedance during charging and a high impedance after it is fully charged. The gate terminal of the SCR is arranged to be contacted by the human body through an isolating impedance and a low pass filter is interposed between the control terminal and a power terminal. The touching by a human body supplies an AC signal from the body to the control terminal. The invention also comprises the use of the switch circuit in various sophisticated manners such as in parallel with different time constants and also in a controllable latched ON-OFF configuration.

This invention relates broadly to switching circuits activated by the touch of a human operator or the electrical equivalent thereof, and more particularly to a DC touch activated momentary and preset momentary switch circuit and a novel compact programmer array circuit utilizing the same.

This invention is related to our copending applications Ser. No. 572,092, filed Aug. 12, 1966, for Touch Activated Semiconductor Switch, and Ser. No. 580,056 for Touch Responsive Momentary Switch Circuit, filed Sept. 16, 1966, with respect to the basic principle of switch activation or triggering, but employs the basic triggering concept in a controlled momentary DC and preset momentary DC semiconductor controlled rectifier or SCR switch, rather than in AC four-layer semiconductor switching circuits, as disclosed in the copending applications, or DC switching circuits that require separate circuit opening means to open the circuit once the DC switch has been activated to close the circuit as disclosed in the first mentioned copending application.

In DC modes of operation, converse to AC operating modes disclosed in the mentioned copending applications, hold-on or latching action is a natural occurrence; whereas achieving turn-off or commutation is the essential problem to be solved. The standard passive network techniques of achieving momentary action in any DC circuit involve the utilization of an inductance in a ringing circuit configuration. However, within reasonable inductance size, (mechanical and electrical) and reasonable cost, inductances are found to be incapable of supplying sufficiently long time constants to shut off the SCR (silicon controlled rectifier) and are thus incompatible with the DC momentary commutation requirements. Furthermore, inductances make the switch circuit sensitive to stray pickup and

transients and the circuitry in the available prior art indicates no possibility for attaining either preset momentary action and/or a wide range of output pulse widths. The simple, passive network commutation scheme of the present invention described herein, using only capacitors and resistors, is believed to be a breakthrough in SCR circuit design technology itself, independent of the means of signal generator activation (i.e. turn-on). Moreover, the "on" condition shows full pulse power switching of the power supply levels available (i.e. ideal pulse switching action). In conjunction with touch activation the basic switch circuit of the present invention takes on even more useful properties.

It is therefore an object of the present invention to provide a construction of DC switching circuit activated by the touch of the human body, or its electrical equivalent, which provides recycling momentary switching action and a wide range of selected output pulse widths.

Another object of the present invention is to provide a simple construction of SCR DC switching circuit which provides automatic switch commutation with the use of only capacitors and resistors.

Another object of the invention is to provide a construction of DC switching circuit which provides preset momentary switching action, activated by the voltage pick-up of the human body to provide such switching action as long as the human body or its electrical equivalent is in contact with the switching circuit.

A further object of the invention is to provide a simple and novel touch activated programmer array switching device utilizing a plurality of interconnected DC recurrent momentary switching circuits, and having a minimum number of output terminals.

Still a further object of the present invention is to provide a construction of a novel DC ON-OFF switch utliizing a pair of the mentioned preset momentary DC switching circuits.

Other and further objects of the invention reside in the simplicity of the basic circuit construction, the compactness of the programmer array circuit device and the ease with which it can be connected into a control circuit, and other objects are set forth more fully in the following specification, and still others will become apparent to one skilled in the art from the following specification, by reference to the accompanying drawings, in which.

FIG. 1 is an electrical schematic diagram of the recurrent momentary DC switch of the invention;

FIG. 2 is a voltage-time graph, illustrating the recurrent momentary output switching action of the circuit of FIG. 1;

FIG. 3 is a voltage-time graph illustrating the preset momentary switching action of the circuit of FIG. 1;

FIG. 4 is an electrical schematic diagram of a programmer array circuit utilizing a plurality of the circuits of FIG. 1;

FIG. 4*a* is a fragmentary schematic diagram of a programmer array circuit illustrating a slight modification of the circuit of FIG. 4;

FIG. 5 is a logic diagram table illustrating the operation of the array of FIG. 4 when one stage of the array at a time is touch actuated;

FIG. 6 is a logic diagram of another modified form of the invention to provide ambiguity cancellation;

FIG. 7 is a logic diagram truth table for the circuit of FIG. 6; and

FIG. 8 is another modified form of the invention showing the basic circuit of FIG. 1 used in an ON-OFF switch circuit.

Referring to the drawings in greater detail, the circuit in FIG. 1 shows a unique technique for producing commutation and resulting recurrent momentary or preset momentary switching action in a DC switching circuit at