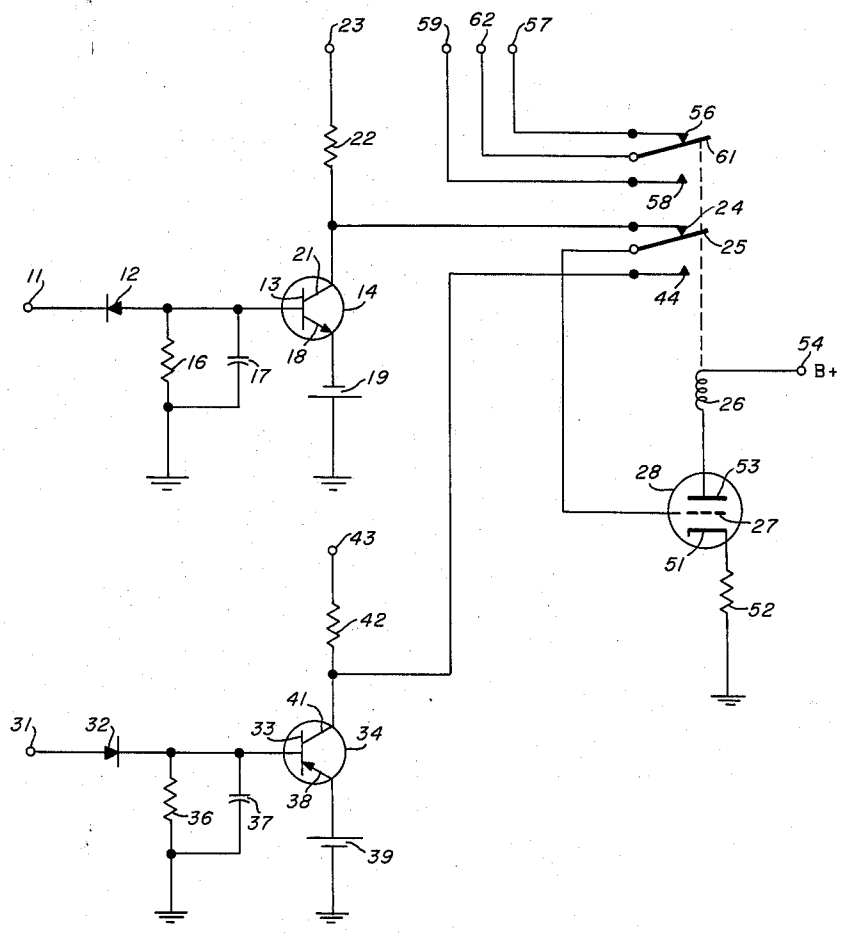
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ELECTRONICALLY ACTUATED SWITCH

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ELECTRONICALLY ACTUATED SWITCH

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to an electronically actuated switch, and more particularly to an electronically actuated switch in which there is isolation between input and output.

The specific type of electronic switch implemented according to the present invention, is an electronic switch which is bistable in nature and responsive to A.C. triggering or positive triggering for one condition, and A.C. or negative triggering for the other stable condition. The input triggers are coupled through appropriately poled diodes to respective opposite conductivity transistors. The output of the negative trigger responsive transistor which is an NPN conductivity type is D.C. coupled through a pair of back contacts of a relay to the control element of an amplifier, which is preferably a vacuum tube amplifier. Quiescently, this transistor is biased for heavy conduction which results in the space discharge device being in a low conduction condition. The output element, e.g. plate, of the space discharge device has a solenoid for the relay contacts in series therewith, with the forward contact connecting the control element to the output of the positive trigger responsive transistor which is an PNP type of conductivity. This PNP transistor is likewise biased for heavy conduction. When a negative signal arrives at the input the NPN transistor is effectively cut off to allow the space discharge device to actuate the relay in its anode circuit. This shifts control to the PNP transistor which is responsive to a positive going signal. The output of the PNP transistor, quiescently, is positive enough to allow the space discharge device to conduct enough current through the relay solenoid to hold the relay closed or actuated. When a positive going signal arrives, the NPN transistor is sufficiently cut-off to drive the space discharge device into cut-off, deactivate the solenoid in its anode circuit, and return control to the NPN transistor. Output utilization can be taken through other contacts coupled to the above mentioned solenoid winding.

It is thus an object of the present invention to provide an electronically actuated switch which is bistable in nature.

Another object is the provision of an electronically actuated switch in which the input and output are completely isolated from each other.

A further object of the invention is the provision of an electronically actuated switch which utilizes a minimum of components.

Yet another object of the present invention is to provide an electronically actuated switch which requires a minimum of maintenance and adjustment.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detail description when considered in connection with the accompanying drawing in which like reference numerals designate like parts throughout the figures thereof and wherein:

The sole figure is a schematic representation of a preferred embodiment of the invention.

Referring to the drawing input terminal **11** is coupled through diode **12** to base **13** of transistor **14**. Base **13** is also connected through resistance **16** and capacitance **17** to ground. Emitter **18** of transistor **14** is connected to the negative terminal of battery **19** the positive terminal of which is connected to ground. Collector **21** of transistor **14** is connected through resistance **22** to positive terminal **23**, and through back contact **24** of solenoid **26** to grid **27** of triode **28**. Input terminal **31** is connected through diode **32** to base **33** of transistor **34**. Base **33** is also connected through resistance **36** and capacitance **37** to ground. Emitter **38** is connected to the positive side of battery **39** the negative side of which is connected to ground. Collector **41** of transistor **34** is connected through resistance **42** to negative terminal **43**. Collector **41** is also connected to back contact **44** of solenoid **26**. Cathode **51** of triode **28** is connected through resistance **52** to ground. Anode **53** of triode **28** is connected through solenoid winding **26** to positive terminal **54**. Back contact **56** is connected to output terminal **57**, forward contact **58** is connected to output terminal **59** and arm **61** is connected to output terminal **62**.

Operation

The system will be described with reference to its utility as a timing circuit but it is to be understood that utility is not limited thereto and any relatively low speed bistable switching purpose can be implemented with the present invention. Assuming, for example, that the time between two pulses is to be measured and they are of an order which would render oscillograph measurements impractical. A counter, for example, could be placed in series with output terminals **59** and **62** such that the counter would start counting when arm **61** contacted forward contact **58** and stopped counting when this circuit was broken. The contacts are shown in their inactuated position. Quiescently, transistor **14** and transistor **34** are both conducting heavily which places a slightly negative potential on collector **21** of transistor **14** and a slightly positive potential on collector **41** of transistor **34** both with respect to ground. Hence, with the relay inactuated as shown and collector **21** connected to grid **27** through contact **24** the triode **28** will not conduct heavily enough to actuate relay **26**. When a signal which can be either negative or A.C. is applied at input terminal this is coupled as a negative signal through diode **12** to base **13** of transistor **14**. This will then cut off transistor **14** which raises the potential on its collector **21** to the point where triode **28** will conduct heavily enough to actuate solenoid **26**. This will then shift arm **25** over to holding contact **44** which shifts control from the circuit of transistor **14** to the circuit of transistor **34**. Here again transistor **34** is quiescently heavily conducting placing a slight positive potential on its collector **41**. This potential will be positive enough to cause enough current to flow through triode **28** to hold relay **26** in its actuated position. When a positive or A.C. signal is then applied at input terminal **31** this will appear as a positive signal across resistance **36** and cause PNP transistor **34** to stop conducting thereby dropping the voltage on collector **41** to a potential negative enough with respect to ground to reduce the conduction through triode **28** to the point where relay **26** will become inactuated and the arms **25** and **61** will return to the position shown. The system is then awaiting a next input pulse at input terminal **11**.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. An electronically actuated switch comprising:

first amplifying means having an input and an output, said first amplifying means susceptible to only negative going input signals;

second amplifying means having an input and an output, said second amplifying means susceptible to only positive going input signals;

third amplifying means having an input and an output;

switching means having first and second inputs and one output, said first and second inputs connected to said first and second amplifying means outputs, respectively, said switching means output connected to said third amplifying means input;

switch control means connected to the output of said third amplifying means, said switch control means coupled to said switching means for controlling said switching means.

2. The electronically actuated switch of claim 1 wherein said first and second amplifiers comprise transistor amplifiers of opposite conductivity.

3. The electronically actuated switch of claim 2 wherein said third amplifier comprises space discharge means.

4. The electronically actuated switch of claim 1 wherein said switching means and said switch control means comprise relay contacts and a relay solenoid, respectively.

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