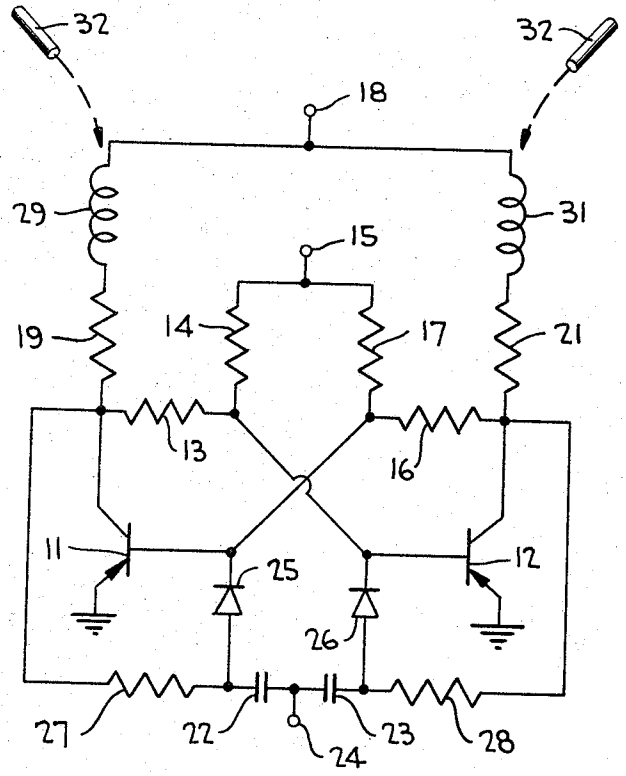
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PRESETTABLE BISTABLE CIRCUITS

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PRESETTABLE BISTABLE CIRCUITS

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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 to us of any royalty thereon.

This invention relates generally to bistable circuits, and more particularly to electronic bistable circuits which permit the storage of preset information in the absence of a supply voltage.

Many tactical ballistic weapons are equipped with timers which operate to initiate the detonation of the war head. These timers are preset before launching the weapon to cause detonation at the point of maximum destruction to the selected target. The information that must be stored in the timer is obtained from a fire control computer or from computations made by fire control personnel after making range finder observations. Electronic timers offer certain advantages in size and accuracy; however, one of the major obstacles to the use of electronic timers in ordnance applications is the need for electrical power to be applied to the shell or missile prior to launching to permit storing the preset information in the timer. It is undesirable to apply the supply voltage to the timer prior to launching for two reasons: First, the application of the supply voltage to preset the timer could constitute an injurious drain on the power supply rendering the weapon a dud. Second, there is the problem of safety to the personnel operating the weapon. The application of the supply voltage prior to launch could cause a premature explosion. Of course, the need for pre-launch power can be dispensed with if the preset information is programmed on mechanical switches, but this introduces problems associated with switch-contact reliability.

It is therefore an object of the instance invention to provide electronic bistable circuits which permit the storing of preset information with no power required.

It is another object of this invention to provide electronic bistable circuits which can store information in the absence of a supply voltage without movable mechanical connections of any sort.

It is a further object of the invention to provide electronic bistable circuits which may be cascaded to form electronic timers for tactical ballistic weapons that can be preset prior to launching without the application of electric power to the weapons.

According to the present invention, the foregoing and other objects are attained by providing within an electronic bistable circuit two hollow core inductors connected so that insertion of a high permeability rod into one or the other of the two inductors causes an unbalance in the bistable circuit sufficient to force the circuit to assume one or the other of its two stable states when a supply voltage is applied to the circuit but insufficient to otherwise affect the normal operation of the circuit.

The specific nature of the invention, as well as other objects, aspects, uses and advantages thereof, will clearly appear from the accompanying drawing, in which the sole figure is a schematic diagram of a symmetrically-triggered, Eccles-Jordan bistable multivibrator which embodies the invention.

Referring now to the drawing there are shown two PNP transistors **11** and **12** connected in common emitter fashion. The collector of transistor **11** is connected to the base of transistor **12** through a cross-coupling network which

comprises a resistive voltage divider having a first resistance **13** connected to the collector of transistor **11** and a second resistor **14** connected through terminal **15** to a source of base supply voltage (not shown), the junction of resistors **13** and **14** being connected to the base of transistor **12**. Similarly, the collector of transistor **12** is connected to the base of transistor **11** through an identical cross-coupling network comprising resistors **16** and **17**. A source of collector supply voltage (not shown) is connected by way of terminal **18** through load resistors **19** and **21** to the collectors of transistors **11** and **12**, respectively. To facilitate cascading to form a timing chain, a symmetrical trigger circuit is provided. This comprises two input coupling capacitors **22** and **23** connected to a source of trigger pulses or a preceding stage (not shown) through terminal **24**. Steering diode **25** connects coupling capacitor **22** to the base of transistor **11**, while steering diode **26** connects coupling capacitor **23** to the base of transistor **12**. Biasing resistors **27** and **28** connected between the collector of transistor **11** and the junction of steering diode **25** and coupling capacitor **22** and between the collector of transistor **12** and the junction of steering diode **26** and coupling capacitor **23**, respectively, provide the biasing voltages for the diodes.

The heart of the invention resides in the provision of hollow core inductors **29** and **31** in series with load resistors **19** and **21**, respectively. Preset information is stored in the circuit by inserting a high permeability iron or ferrite rod **32** into either of the hollow core inductors **29** or **31**. The inductor into which rod **32** is inserted will have its inductance increased thereby causing the circuit to become unbalanced in the desired predetermined manner.

It has been determined experimentally that the transistor having the collector circuit which has the rod inserted in its coil will be in the ON or zero voltage state when the supply voltage is applied. Contrary to this observation, one might think that the transistor employing the lower inductance would be in the ON state when power is applied to the circuit. If collector drive played the dominant role in the initial conditions after the supply voltage is applied, indeed the lower inductance side would be in the ON state. It was found, however, that the base drive plays the dominant role in determining initial conditions in the circuit.

When both collector circuits employ coils of the same inductance and a high permeability rod is not inserted in either coil, the transistor with the lower β is the more likely to be in the OFF state when power is applied to the circuit. Consequently, in determining the inductance necessary for satisfactory presetting, the rod is inserted in the coil of the transistor with the lower β and that transistor checked for the ON state. For transistors having equal β's, smaller inductance coils will accomplish satisfactory preset action.

The presence or absence of the rod inserts is immaterial once power is supplied, and thus the insert can stay in with no injurious effect. However, if the circuit is intended to operate at high frequencies, the hollow core inductors become a limiting factor with regard to the maximum operating frequency of the circuit.

It should be understood, of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that numerous bistable circuits employing the principle of inductive unbalance to permit the storage of preset information without the application of a power supply may be made without departing from the spirit and the scope of the invention as set forth in the appended claims.

We claim as our invention:

1. In an electronic bistable circuit, the improvement comprising two hollow core inductors incorporated within said electronic bistable circuit, a high permeability rod inserted into a selected one or the other of said hollow core inductors to cause an unbalance in said electronic bistable circuit sufficient to force said electronic bistable circuit to assume one or the other of its two stable states when a supply voltage is applied to said electronic bistable circuit, said unbalance in said electronic bistable circuit caused by the insertion of a high permeability rod into one or the other of said hollow core inductors being insufficient to otherwise affect the normal operation of said electronic bistable circuit.

2. In an electronic bistable multivibrator circuit having two non-linear electronic elements each connected in series with a separate load impedance and a common source of supply voltage and two cross-coupling networks interconnecting said two non-linear electronic elements to cause said two non-linear electronic elements to assume complementary states when the supply is on, the improvement comprising two hollow core inductors, each connected in series with a respective one of said separate load impedances and having a value that upon insertion of a high permeability rod into one or the other of said hollow core inductors causes an unbalance in said electronic bistable multivibrator circuit sufficient to force said electronic bistable multivibrator circuit to assume one or the other of its two stable states when the supply voltage is turned on but insufficient to otherwise affect the normal operation of said electronic bistable multivibrator circuit.

3. In an electronic bistable multivibrator circuit having two transistors each connected in common emitter configuration with a separate series load resistance connecting the collector of each transistor to a common source of supply voltage and two cross-coupling networks respectively interconnecting the collector circuit of each transistor with the base circuit of the other transistor to cause said two transistors to assume complementary conducting states when the supply voltage is on, the improvement comprising two hollow core inductors, each connected in series with a respective one of said series load resistors and having a value that upon insertion of a high permeability rod into one or the other of said hollow core inductors causes an unbalance in said electronic bistable multivibrator circuit sufficient to force said electronic bistable multivibrator circuit to assume one or the other of its two stable states when the supply voltage is turned on but insufficient to otherwise affect the normal operation of said electronic bistable multivibrator circuit.

No references cited.

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