

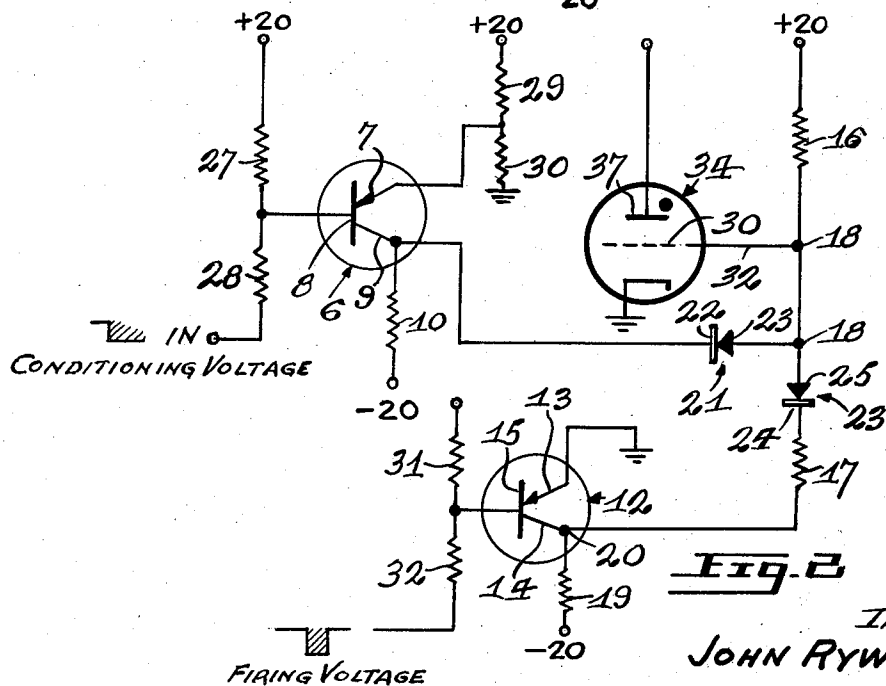
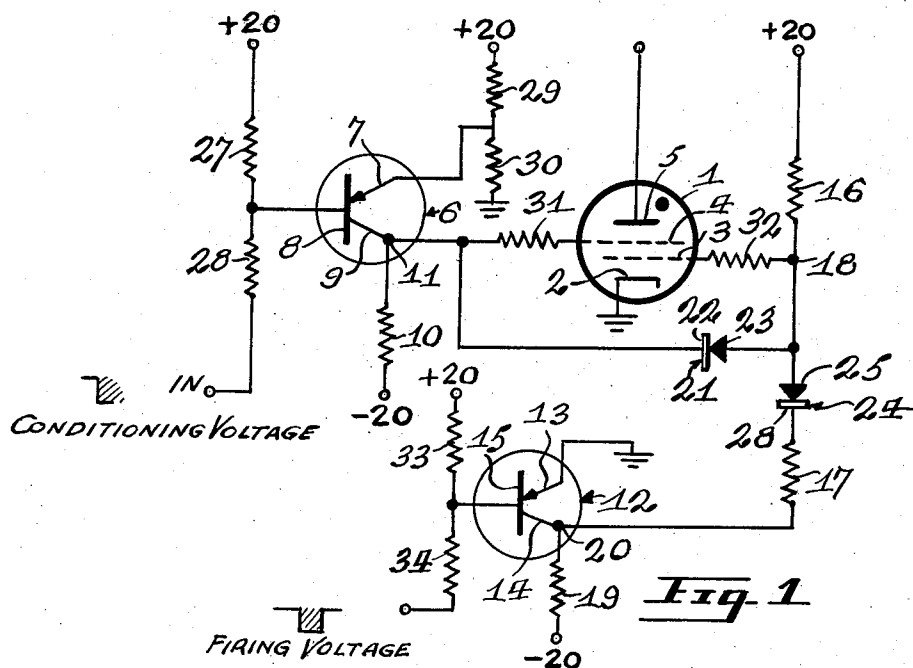
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THYRATRON CONTROL CIRCUIT

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1

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THYRATRON CONTROL CIRCUIT

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4 Claims. (Cl. 315-168)

This circuit relates to a thyatron control circuit and more particularly to a circuit for triggering a thyatron by means of transistor circuitry.

It is sometimes desirable to utilize a thyatron having two control grids, one of which is biased sufficiently negative with respect to the cathode of the tube so that a positive potential of predetermined magnitude, applied to the firing grid, is unable to trigger the tube. In the normal operation, the firing point of the thyatron is determined by the effect of a controlling pulse placed on one or the other of the two grids, the voltage of which is made sufficiently large in order to assure the proper performance of the tube. However, when it is desired to control the firing of the thyatron by means of transistor circuitry, where large voltages are not available, the problem becomes one of reliability of operation.

The principal object of this invention is to provide a control circuit for a two grid thyatron tube by means of transistor circuitry.

Another object of this invention is to provide a control circuit for a single grid thyatron tube by means of transistor circuitry.

These and other objects of this invention are attained in one embodiment by providing a circuit arrangement, in association with a thyatron tube having a conditioning grid electrode and control grid electrode, in which the bias on the grids is controlled by a pair of steering semiconductor elements, arranged back-to-back, poled in the desired directions by the state of energization of a transistor individually connected to each semiconductor element.

A better understanding of the invention may be had by referring to the following description, taken in conjunction with the drawing in which like numbers refer to like parts in which:

Fig. 1 shows a schematic circuit of one embodiment of the invention illustrating the circuit arrangement for the control of a two grid thyatron tube; and

Fig. 2 shows a schematic circuit of another embodiment of the invention illustrating the circuit arrangement for the control of a single grid thyatron tube.

Considering Fig. 1 of the drawings there is shown a thyatron tube, generally shown by the numeral 1, having a cathode 2, a control grid 3, a conditioning grid 4, anode 5, p-n-p transistor, generally shown by the numeral 6, having an emitter electrode 7, base electrode 8, collector electrode 9, collector resistor 10 connected to the conditioning grid 4 and collector electrode 8 at the junction point 11.

There is also shown a second p-n-p transistor, generally shown by the numeral 12 having an emitter electrode 13, collector electrode 14, base electrode 15, a pair of resistors 16, 17 to which the control grid 3 is connected at the junction predetermined point 18, a col-

2

lector resistor 19 connected to the junction point 20. The resistance of resistor 16 should be larger than the resistance of resistors 17 and 19.

A unilateral conducting element, generally shown by the numeral 21 and having cathode 22, anode 23, is connected between the junction points 11 and 18, while a unilateral conducting element, generally shown by the numeral 24 and having cathode 25, anode 26, is connected between the junction point 18 and the collector electrode 14 of transistor 12. The numerals 27, 28, 29, 30, 31, 32, 33, 34 indicate current limiting resistance elements.

Fig. 2 illustrates a schematic circuit the same as shown in Fig. 1 except that the thyatron tube 34 is a triode having a cathode 35, control grid 36 and anode 37.

In the operation of the circuit, in the non-operated or normal condition, with transistor 6 in the non-conducting condition, the potential at junction 11, as determined by the potential of collector 9 of transistor 6 and the polarity of the biasing energy applied thereto, is at a negative potential with respect to the cathode 2 of the thyatron tube 1. Also the potential at the junction 18 is less negative than the potential of cathode 2, as determined by the resistance relation between resistor 16 and resistor elements 17, 19, unidirectional elements 21 and 24 thus conducting so that junction 18 assumes the same potential as junction 11. Any accidental positive pulse originating at transistor 12 will not be received on control grid 3 of the thyatron tube 1 since unidirectional element 24 would become non-conducting.

If now a negative voltage is applied to the base electrode 8 of transistor 6 of this transistor 6 becomes conducting, a circuit being completed through resistance element 10. Junction 11 therefore becomes more positive with respect to its previous potential, and unilateral conducting element 21 becomes non-conducting. If now a negative pulse is applied to the base electrode 15 of transistor 12, a circuit is completed through resistance element 19 so that the collector 14 of transistor 12 reaches ground potential and unilateral conducting element 24 applies a positive bias to the control grid 3 of thyatron tube 1 through resistance element 16, the tube 1 triggering. The grids 3 and 4 now lose control of the triggering of the tube, the control returning thereto by reducing the plate voltage or by other well known means.

In the operation of the circuit shown in Fig. 2, due to the polarity of the energy sources, the polarity of the junction 18 is slightly at a negative potential as determined by the resistors 16 and 17 and 19, with respect to the cathode 2 of the thyatron tube 34, so that unilateral conducting element 21 conducts. If now a negative voltage is applied to the base 8 of transistor 6, this transistor 6 becomes conducting so that the cathode 22 of unilateral conducting element 21 assumes a more positive potential than anode 23 and the unilateral conducting element 21 therefore becomes non-conducting so that junction 18 assumes a potential as determined by resistors 16, 17 and 19. If now a negative pulse is applied to the base electrode 15 of transistor 12 this transistor 12 conducts completing a circuit through resistors 19 so that junction point 18 and control grid 36 assumes a positive potential with respect to the cathode 2 of thyatron tube 34, as determined by the resistor 16, the tube 34 triggering. Control grid 36 loses control of tube 34, the control being returned by reducing the plate voltage or by other well known means.

Purely by the way of example and in a no limiting

sense, suitable values for the resistors used in connection with this circuit are:

Resistance element:	Value
10 -----	4.7K
16 -----	82K
17 -----	27K
19 -----	4.7K
27 -----	18K
28 -----	27K
29 -----	680K
30 -----	680K
31 -----	100K
32 -----	100K
33 -----	470K
34 -----	47K

It is to be understood that the above embodiment is by the way of illustration only, there being other embodiments, in which different types of transistors may be employed.

What is claimed is:

1. An electron circuit arrangement employing a gas filled electronic discharge tube having a cathode, a conditioning grid, a control grid, and an anode having in combination with the discharge tube: a first p-n-p transistor having an emitter, a collector and a base electrode, a first collector resistor, means for connecting the collector resistor and the conditioning grid to a first predetermined point on the collector electrode; a first source of direct current having its negative terminal connected, through the collector resistor, to the first predetermined point and its positive terminal to the emitter electrode; a second p-n-p transistor having an emitter, a collector and a base electrode, a pair of resistors connected in series relation, the control grid being connected to a second predetermined point; a second collector resistor, means for connecting the second collector resistor and a free terminal of the pair of resistors to a third predetermined point on the collector electrode of the second transistor; a second source of direct current having its negative terminal, through the second collector resistor, connected to the third predetermined point and its positive terminal connected to other free terminal of the pair of resistors; an unilateral element individually disposed between the first and second predetermined points, with its cathode and anode connected to these points respectively, and between the pair of resistors with its anode and its cathode, through the resistor of the pair thereat, connected to the second and third predetermined points respectively; means for rendering the transistors conductive.

2. An electric circuit in accordance with claim 1 in which said unilateral conducting elements comprise semiconductor diodes.

3. An electron circuit arrangement employing a gas

filled electronic discharge tube having a cathode, a control grid and an anode having in combination with the discharge tube: a first p-n-p transistor having an emitter, a collector and a base electrode, a first collector resistor connected to a first predetermined point on the collector electrode; a first source of direct current having its negative terminal connected, through the collector resistor, to the first predetermined point and its positive terminal to the emitter electrode; a second p-n-p transistor having an emitter, collector and base electrode, a pair of resistors connected in series relation the control grid being connected to a second predetermined point thereon, a second collector resistor, means for connecting the second collector resistor and a free terminal of the pair of resistors to a third predetermined point on the collector electrode of the second transistor; a second source of direct current having its negative terminal connected, through the second collector resistor to the third predetermined point and its positive terminal connected to the other free terminal of the pair of resistors; an unilateral element individually disposed between the first and second predetermined points, with its cathode and anode connected to these points respectively and between the pair of resistors with its anode and its cathode, through the collector resistor, connected to the second and third predetermined points respectively; means to render the transistors conductive.

4. An electron circuit arrangement employing a gas filled electronic discharge tube having a cathode, a conditioning grid, a control grid and an anode having in combination with the discharge tube: a first p-n-p transistor having an emitter, collector and base electrode, a first collector resistor, means for connecting the collector resistor and the conditioning grid to a first predetermined point on the collector electrode; a first source of direct current having its negative terminal connected, through the collector resistor, to the first predetermined point and the positive terminal to the emitter electrode; a second p-n-p transistor having an emitter, collector and base electrode, a pair of transistors connected in series relation, the control electrode being connected to a second predetermined point thereon; a second collector resistor, means for connecting the second collector resistor and a free terminal of the pair of resistors to a third predetermined point on the collector electrode of the second transistor; a second direct current source having its negative terminal, through the second collector resistor, connected to the third predetermined point and its positive terminal connected to the other free terminal of the pair of resistors, an unilateral element connected between the first and second predetermined points, with its cathode and anode connected to these points respectively; means for rendering the transistors conductive.

No references cited.