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D. L. GARDNER

3,217,601

GUN FIRING CONTROL DEVICE

Filed May 26, 1964

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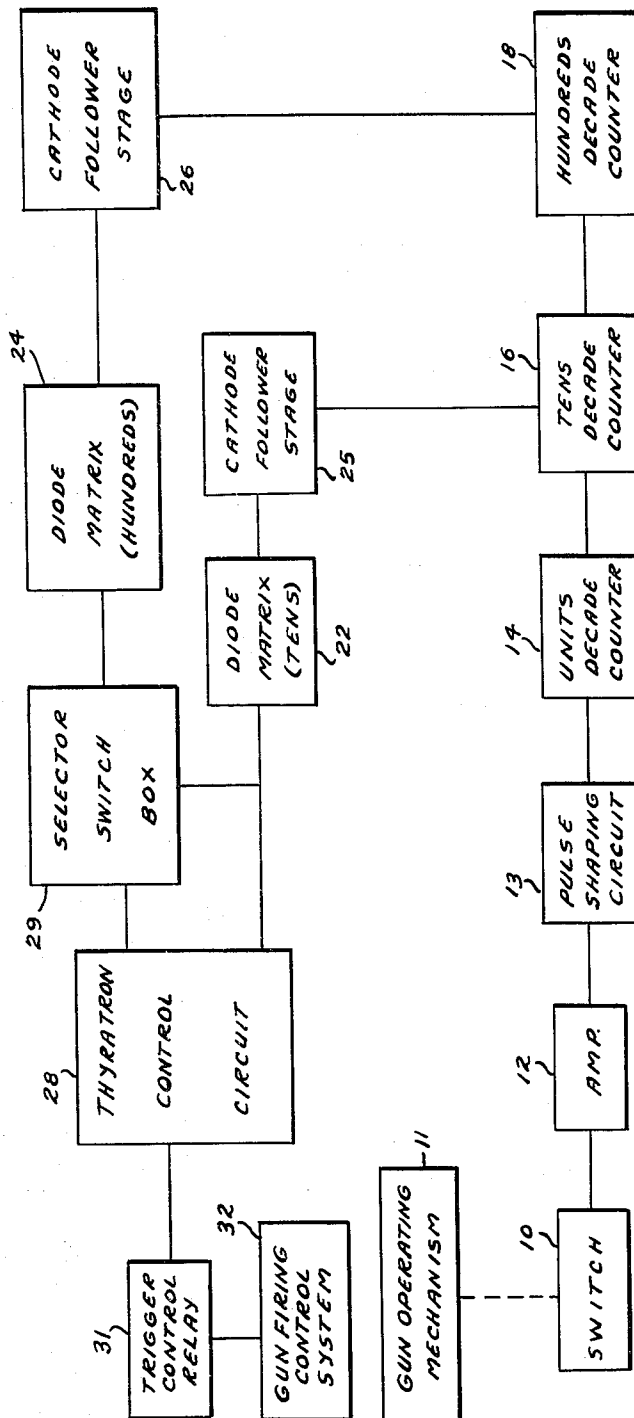


Fig. 1

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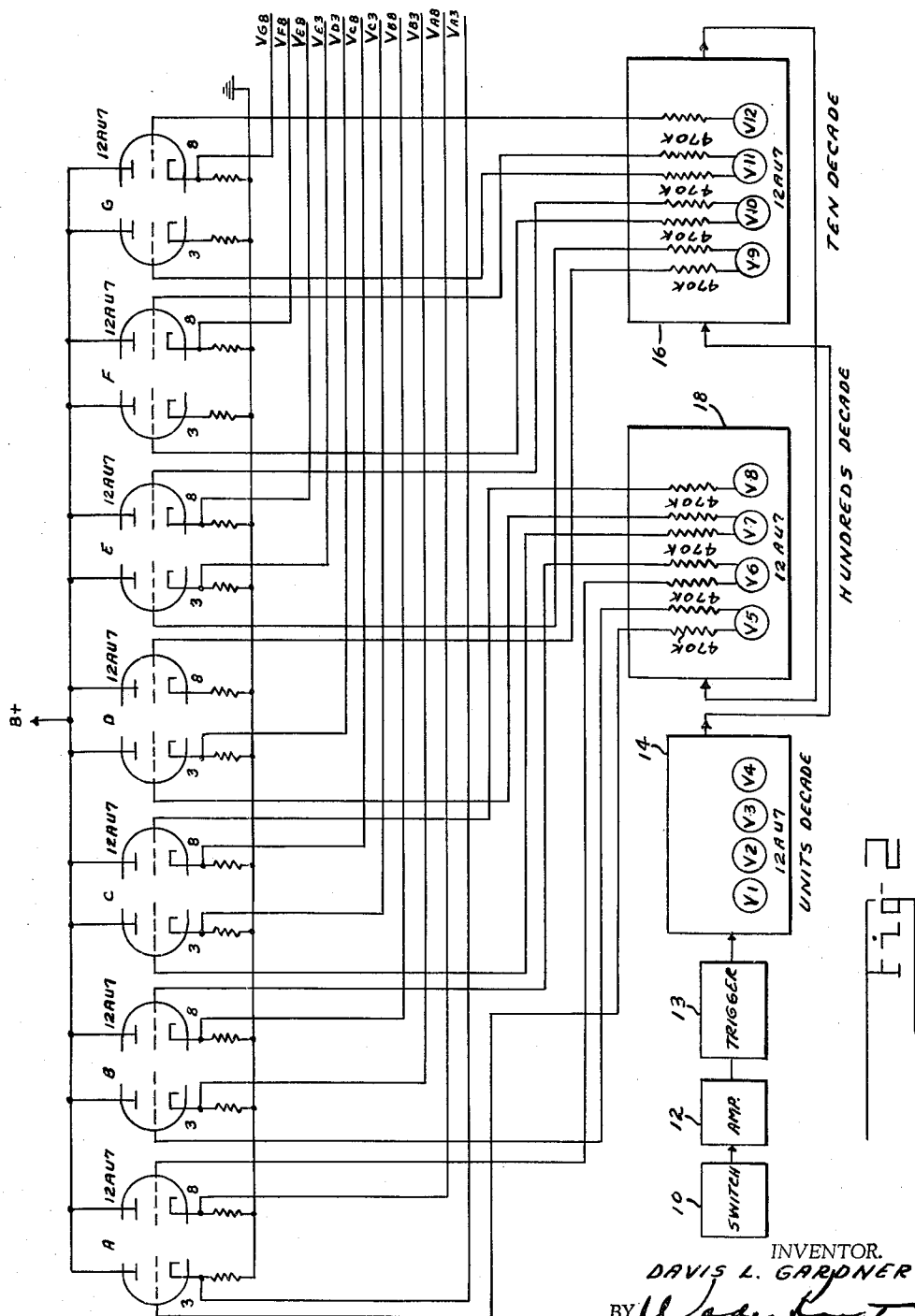
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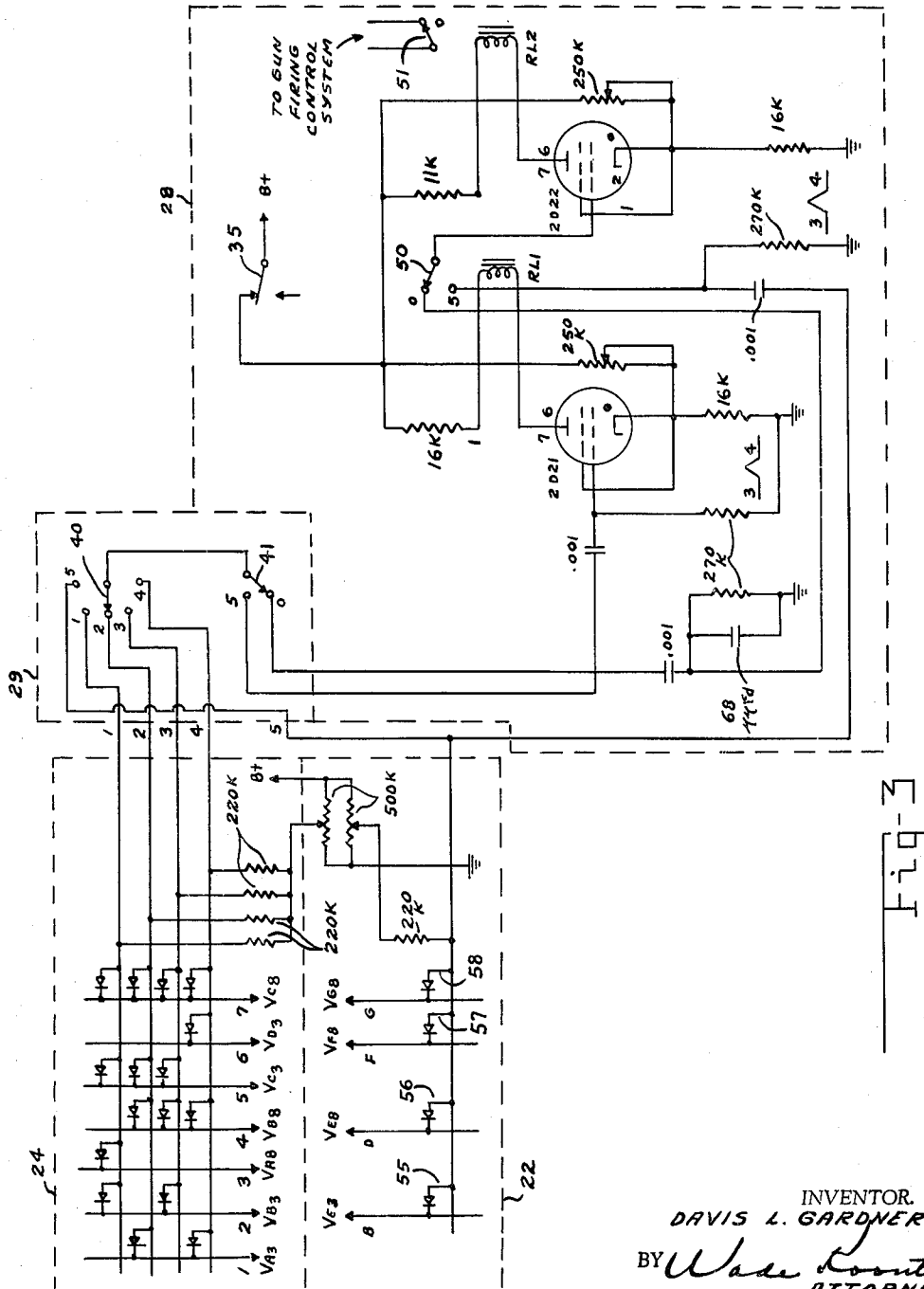
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GUN FIRING CONTROL DEVICE

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3 Claims. (Cl. 89-135)

This invention relates to a device for controlling the number of rounds fired by a high speed gun.

One object of the invention is to provide a device for presetting the number of rounds to be fired from a gun.

Another object of the invention is to provide a device for stopping the firing of a gun after a predetermined number of rounds have been fired.

These and other object will be more fully understood from the following detailed description taken with the drawing, wherein:

FIG. 1 is a block diagram of the system of the invention for controlling the number of rounds fired from a gun;

FIG. 2 is a circuit schematic partially in block form for the round counter for the device of FIG. 1;

FIG. 3 is a circuit schematic of the diode matrix, selector and thyatron control system for the device of FIG. 1;

FIG. 4 is a circuit schematic for one of the decade counter and cathode follower circuits for the device of FIG. 1.

When engaged in gun experimentation and testing it is sometimes desirable to control the number of rounds fired from a high speed gun. The device of this invention uses a switch which is mechanically connected to the gun operating mechanism to furnish a pulse each time a round is fired. For example, when testing a Gatlin gun a switch closure could be furnished each time a barrel is moved into the firing position, or on other guns a switch could be closed each time a shell case is ejected. However, the particular mechanical connection between the switch and the gun would be determined by the gun tested and forms no part of this invention. The pulse produced by the switch closing is applied to a counting circuit the output of which is applied to a diode matrix. The output of the diode matrix is applied to a thyatron control circuit through a selector switch. The control circuit then operates a relay whose contacts are connected in the circuit which controls the firing of the gun.

Referring now to FIG. 1 of the drawing wherein switch 10 is mechanically controlled by a portion of the gun operating mechanism indicated generally at 11. The output pulse from switch 10 may be amplified in an amplifier 12 and applied to three standard decade counters 14, 16 and 18, connected in series, through a pulse shaping circuit 13 which may be a Schmitt trigger circuit. These counters are capable of counting to 1000 pulses however the device described uses a maximum count of 450 pulses. The full count of 1000 or additional decade counters for higher counts may be provided if needed for certain applications.

The outputs of only the tens and hundreds decades 16 and 18 are fed to the tens and hundreds diode matrices 22 and 24 respectively through the cathode follower stages 25 and 26, as shown in FIGS. 2 and 3, since only preset counts of 50, 100, 150, 200, 250, 300, 350, 400 and 450 were used in the device built. The output leads in FIG. 2 are connected to correspondingly numbered leads in FIG. 3. A detailed circuit schematic for the hundreds decade counter, cathode follower and diode matrix is shown in FIG. 4. The output of the hundreds matrix is fed to the thyatron control circuit 28 through selector switch box 29. The output of the tens matrix

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22 is fed to the thyatron control circuit 28 through the selector switch box 29 for the 50 count and directly to the thyatron control circuit 28 for the 150, 250, 350 and 450 counts. The thyatron control circuit operates a trigger control relay 31 to open the circuit in the gun firing control system 32. A relay 34, shown in FIG. 4, is connected to a reset switch, not shown, and when energized resets all of the decade counters to zero and opens the circuit to the thyatrons by opening switch 35 in control circuit 28. Through the reset line 36 is shown as only connected to the hundreds counter this line is also used to reset the units and tens counters.

In the operation of the device of the invention the reset relay 34 is operated to apply the reset voltage to all of the counters to reset them to zero count and to clear the thyatron circuits. When the relay 34 is released the system is ready for a new count. The selector switch 29 is then set for the desired count which for purposes of illustration will be taken as a 200 count. The selector switch 29 is then set for the desired count which for purposes of illustration will be taken as a 200 count. The selector switch in FIG. 3 will have its contact 40 located at the 2 position in the output of the hundreds matrix and contact 41 to the input of the thyatron circuit at the 0 position. At the start of the count with the counters set at zero, all of the tubes V_1 , V_2 , V_3 and V_4 indicated with 0 in FIG. 4 will be conducting as well as the corresponding tubes in counters 14 and 16. The unit counter 14 will then be stepped one count for each round fired. When counter 14 reaches a ten count, it is reset to zero count and applies a one count to the tens counter 16 in the usual manner. When the tens counter reaches a tens count a one count is applied to the hundreds counter 18 in the same manner. When the count reaches 200 only V_2 will have the side indicated with 1 conducting. Thus, diodes 43, 44, 45 and 46 will be energized to apply an output to the number 2 line of the selector box. Since the switch 41 is in the zero position this signal is applied to the thyatron 2D22 through the relay contact 50 of the RL1. This energizes the trigger control relay RL2 to open the contacts 51 to interrupt the firing of the gun. If a count of 250 is desired the switch 41 is located in the 5 position. When the 200 count is reached the signal is then applied to the thyatron 2D21. The relay RL1 is then energized to move contact 50 to the 5 position. When the 50 count is then reached in the tens decade counter the diodes 55, 56, 57 and 58 in the tens matrix are energized supplying a signal to the thyatron 2D22 through the 5 position contact of relay RL1 to thus interrupt the firing of the gun in the manner described above. Since the thyatron 2D21 will not fire until at least a 100 count is reached in the hundreds decade counter, the .5 position is provided on the switch 40 when a 50 count is desired. This contact is connected to the output of the tens diode matrix. With the switch 40 in this position and switch 41 in the zero position thyatron 2D22 will fire after a 50 count.

There is thus provided a device for controlling the number of rounds fired from a high speed gun.

While a certain specific embodiment has been described in detail, it is obvious that numerous changes may be made without departing from the general principles and scope of the invention.

I claim:

1. A device for controlling the number of rounds fired from a gun having a particular mechanism for operating the gun comprising: a plurality of decade counters connected in series; means, responsive to the operating mechanism of said gun, for applying a signal pulse to the first of said series connected decade counters for each round fired from said gun; a thyatron control circuit; a

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diode matrix having a plurality of output lines; means, connecting certain diodes of said diode matrix to corresponding output circuits of said decade counters, for providing an output from said diode matrix corresponding to certain predetermined counts in said decade counters; means for selectively connecting the outputs of said diode matrix to said thyatron control circuit; and means connected in the output circuit of said thyatron control circuit for interrupting the firing of said gun when said thyatron control circuit is energized.

2. A device for controlling the number of rounds fired from a gun having a particular mechanism for operating the gun comprising: a plurality of decade counters connected in series; means, responsive to the operating mechanism of said gun, for applying a signal pulse to the first of said series connected decade counters for each round fired from said gun; a relay having contacts connected in the firing control circuit of said gun; a thyatron control circuit; means for connecting said relay in the output of said thyatron control circuit; a diode matrix having a plurality of output lines; means, connecting certain diodes of said diode matrix to corresponding output circuits of said decade counters, for providing an output from said diode matrix corresponding to certain predetermined counts in said decade counters and means for selectively connecting the outputs of said diode matrix to said thyatron control circuit.

3. A device for controlling the number of rounds fired from a gun having a particular mechanism for operating the gun comprising: a plurality of decade counters connected in series; means, responsive to the operating mechanism of said gun, for applying a signal pulse to the first of said series connected decade counters for each round fired from said gun; a first relay having contacts connected in the firing control circuit of said gun, a thyatron control circuit; said thyatron control circuit including a

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first and second thyatron; means for connecting said first relay in the output circuit of said second thyatron; a first and a second diode matrix each having a plurality of output lines; means, connecting certain diodes of said first diode matrix to corresponding output circuits of one of said decade counters, for providing an output from said diode matrix corresponding to certain predetermined counts in said one decade counters; means, connecting the diodes of said second diode matrix to corresponding output circuits of a second of said decade counters, for providing an output from said second diode matrix corresponding to certain predetermined counts in said second decade counter; a switch having one movable contact and two stationary contacts; means for selectively connecting one of the output circuits of said second diode matrix and said output circuits of said first diode matrix to said movable switch contact; one of the stationary contacts of said switch being connected to the control element of said first thyatron; a second relay connected in the output circuit of said first thyatron; said second relay having one movable contact and two stationary contacts; the movable contact of said relay being connected to the control element of said second thyatron; one of the stationary contacts of said relay being connected to a second output of said second diode matrix and the other stationary contact of said relay being connected to the other stationary contacts of said switch.

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