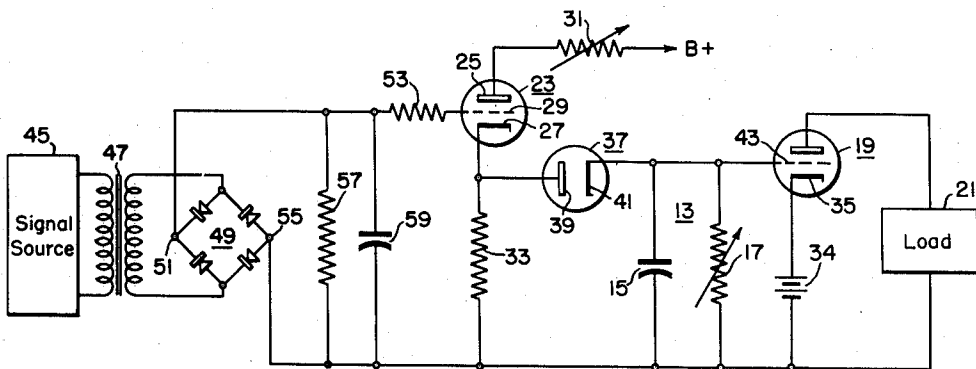


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ELECTRICAL APPARATUS
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WITNESSES:

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ELECTRICAL APPARATUS

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My invention relates to electrical apparatus and more particularly to circuit arrangements for actuating a load device and retaining it in the actuated state for a predetermined time interval.

My invention is applicable in cases where electric signals of varying amplitude and duration are employed to accomplish quick actuation of a load device and it is desired that the load device should remain in the actuated state for an interval of time which is independent of variations in the strength and duration of the actuating signal.

An object of my invention is to provide an improved circuit arrangement which will assure fast actuation of a load device and which will retain the load device in the actuated state for an interval of time which is independent of the strength and duration of the actuating signal.

Another object of my invention is to provide electrical apparatus for accomplishing quick actuation of a load device by signals which furnish only a portion of the required actuating energy.

Another object of my invention is to provide apparatus for quick actuation of a load device with voice signals and wherein the load device will remain actuated for the same time interval, whether actuated by low level or high level voice signals, or whether the actuating signal is of a long or short duration.

In accordance with my invention, a time constant network is connected to the input, or actuating circuit of a load device. The time constant network is charged by suitable means through an isolating device such as a rectifier, to a predetermined voltage which is less than the voltage required to actuate the load device. The actuating signals are applied to an amplitude limiting device and the limited signals are then applied through the isolating device to the time constant network. The voltage of the time constant network is thus quickly increased to a magnitude which is sufficient for actuation of the load device. The total voltage to which the time constant network is charged will be substantially constant and independent of the duration or amplitude of the actuating signals. Hence, the load device will remain actuated for a time interval which is also independent of the actuating signal amplitude and duration.

The invention is particularly useful in power line carrier communication systems of the type in which the equipment is automatically switched

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from its standby condition to either the transmit or the receive condition by voice signals. When one party speaks into his microphone, the transfer unit should immediately operate to switch the equipment from the standby to the transmit condition. The equipment should then remain in the transmit condition for an accurately established brief period of time after voice signals cease, to allow for pause between the words of the speaker. This period of time should be independent of the amplitude or duration of the voice signals. In brief, the transfer unit should operate so that a normal two-way conversation may be carried on in a natural manner.

The features of my invention, which I consider novel, are set forth in the appended claims. The invention, together with additional objects and advantages thereof will be understood from the following description of a specific embodiment when read in connection with the accompanying drawing in which the single figure is a schematic diagram showing a preferred embodiment of my invention.

In the drawing there is shown a time constant network 13 consisting of a capacitor 15 which is shunted by a variable resistance 17. The time constant network is connected across the input circuit of an actuating tube which is shown as a triode 19, which in turn may be connected to operate a relay or other suitable load device shown as a block 21. A suitable electron discharge device 23 having an anode 25, a cathode 27 and a control electrode 29 has its anode connected through a variable resistance 31 to the positive terminal, marked B+, of a power supply, not shown. The cathode 27 of this discharge device is connected through a cathode resistor 33 to the negative terminal of the power supply, which is common to one terminal of the time constant network 13. The cathode 35 of the triode is connected through a suitable bias, shown as a battery 34, to the negative terminal of the power supply. An isolating device shown as a diode rectifier 37 has its anode 39 connected to the cathode 27 of the electron discharge device 23 and its cathode 41 connected to the positive terminal of the time constant network, which is common to the grid 43 of the triode 19. A source of actuating signals, shown as a block 45 has its output connected across the primary winding of a transformer 47, the secondary winding of which is connected to the input terminals of a full-wave bridge rectifier 49. One output terminal 51 of the full-wave rectifier 49 is connected through a limiting resistor 53 to the control elec-

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trode 29 of the electron discharge device 23, while the other terminal 55 is connected to the negative terminal of the power supply. The output terminals 51, 55 of the rectifier 49 are shunted by a resistor 57 and a filter capacitor 59.

In operation with no actuating signals present, the electron discharge device 23 will draw some plate current as determined by the variable resistance 31 in its anode circuit, and a voltage will appear across the cathode resistor 33. The voltage across the cathode resistor will cause the capacitor 15 of the time constant network 13 to charge through the diode 37 to a predetermined voltage which is not of sufficient magnitude to actuate the load device 21, but which is sufficient to reduce considerably the time required to reach the actuating voltage upon application of an actuating signal. When an actuating signal is applied, the voltage which is produced on the secondary winding of the transformer 47 is rectified and applied to the control electrode 29 of the electron discharge device 23, thereby increasing its plate current, and raising the voltage across the cathode resistor 33, which will in turn cause the capacitor 15 of the time constant network 13 to be quickly charged to the voltage magnitude required for actuation of the load device 21. Upon cessation of the actuating signal, the voltage across the cathode resistor 33 will drop to its standby value, but due to the unidirectional action of the diode 37, the capacitor 15 of the time constant network 13 must discharge through its associated resistance 17. The magnitude of the resistance 17 in the time constant network 13 can be adjusted so that the load device 21 will remain in the actuated state for a selected predetermined time interval which may be made much longer than the actuating time. The limiting resistor 53 in the control electrode circuit of the electron discharge device 23 prevents the voltage developed across the cathode resistor 33 from rising above a certain magnitude. The range of voltage across the cathode resistor 33, and consequently across the capacitor 15 of the time constant network 13, is thus kept between the maximum and the standby magnitudes. This range can be adjusted to fairly narrow limits, and thus the time constant network discharge time is substantially independent of the strength of the actuating signals. Since the time constant network capacitor is quickly charged to the maximum magnitude upon application of actuating signals, it is immediately ready to discharge all of its energy through the associated resistance, and hence the discharge time is independent of the duration of the actuating signals.

The specific embodiment which I have just described is susceptible to various modifications without departing from the scope of the invention. For example, the actuating signal rectifier may be in the form of a half-wave or a full-wave rectifier and may use dry rectifier elements as well as discharge devices. The time constant network resistance may be a potentiometer or it may be a combination of resistors controlled by switches.

While I have shown my invention in only one form, it will be obvious to those skilled in the art that it is not so limited.

I claim as my invention:

1. In combination, an electrically operable device actuable by voltages above a predetermined magnitude, a source of actuating signals of varying magnitudes, means for limiting said actuat-

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ing signals to a fixed magnitude, means for establishing on said device prior to application of said actuating signals a voltage having a magnitude slightly less than said predetermined magnitude and such that the sum of the magnitudes of the limited signals and said last mentioned voltage will exceed said predetermined magnitude, and means for superimposing said limited signals on said last mentioned voltage to actuate said device.

2. In combination, an electrically operable device actuable by voltages above a predetermined magnitude and to be actuated from a source of signals which are subject to wide variations in magnitude, charge storage means, means for charging said storage means to a fixed voltage of magnitude slightly less than said predetermined magnitude, means for applying the voltage of said storage means to said device prior to the application of said actuating signals, means for limiting said signals to a fixed magnitude which when added to said last mentioned voltage will exceed said predetermined magnitude, and means for superimposing the limited signal voltage on the voltage of said storage means to actuate said device.

3. Electrical apparatus for fast actuation of a load device by a signal subject to wide amplitude variations and for retaining said load device in the actuated state for an interval which is independent of signal amplitude variations, comprising a time constant network, means for charging said network to a predetermined voltage less than that required to actuate said load device, means connecting said network to said load device, a rectifier interposed between said charging means and said network, means limiting said signal to a predetermined amplitude, and means for applying said limited signal through said rectifier to said time constant network whereby said network will be quickly charged to a predetermined voltage sufficient to actuate said load device, and said load device will remain actuated for a fixed interval of time which is independent of the amplitude variations of said signal.

4. Electrical apparatus for fast actuation of a load device by a signal subject to variations in strength and for retaining said load device in the actuated state for an interval of time which is independent of signal strength variations, comprising a capacitor shunted by a resistance, means for charging said capacitor to a predetermined voltage which is less than that required to actuate said load device, means connecting said capacitor to supply voltage to said load device, a rectifier interposed between said charging means and said capacitor means for limiting said signal to a predetermined amplitude, and means for applying said limited signal through said rectifier to increase the charge on said capacitor to the voltage magnitude required for actuation of said load device, whereby said load device will be quickly actuated and will remain actuated for a fixed interval of time which is independent of the amplitude variations of said signal.

5. Electrical apparatus for fast actuation of a load device by signals subject to wide amplitude variations and for retaining said load device in the actuated state for an interval of time which is independent of signal duration or amplitude, comprising a capacitor shunted by a resistance, a rectifier, means for charging said capacitor through said rectifier to a predetermined voltage of magnitude less than that re-

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quired to actuate said load device, means connecting said capacitor to supply voltage to said load device, means for limiting said signal to a predetermined amplitude, and means for applying said limited signal through said rectifier to increase the charge on said capacitor to the voltage magnitude required for actuation of said load device, whereby said load device will be quickly actuated and will again remain actuated for a fixed interval of time which is independent of the duration and amplitude of said signal.

6. Electrical apparatus for fast actuation of a load device by signals subject to wide amplitude variations and for retaining said load device in the actuated state for an interval of time which is independent of signal duration or amplitude, comprising a capacitor connected across the input circuit of said load device, a resistance shunting said capacitor, an electron discharge device having an anode, a cathode, and a control electrode, energizing means for said anode, a resistor connected between said cathode and one terminal of said capacitor, means connecting said rectifier between said cathode and the other terminal of said capacitor such that said capacitor will be charged to a predetermined voltage which is less than that required to actuate said load device, means for applying said signal through a limiting resistor to said control electrode, whereby the charge on said capacitor will be increased to a predetermined magnitude which is sufficient to actuate said load device, whereby said load device will be quickly actuated and will remain actuated for a fixed interval of time which is independent of the duration and amplitude of said signal.

7. Electrical apparatus for fast actuation of a load device by a voice signal which is subject to wide amplitude variations and for retaining said load devices in the actuated state for an interval of time which is independent of signal amplitude variations, comprising a capacitor connected across the input circuit of said load device, a resistance shunting said capacitor, an electron discharge device having an anode, a cathode, and a control electrode, energizing means for said anode, a resistor connected between said cathode and one terminal of said capacitor, means connecting said rectifier between said cathode and the other terminal of said capacitor such that said capacitor will be charged to a predetermined voltage which is less than that required to actuate said load device, means for rectifying said signal, means for applying said rectified signal through a limiting resistor to said control electrode, whereby the charge on said capacitor will be increased to a predetermined magnitude which is sufficient to actuate said load device, whereby said load device will be quickly actuated and will remain actuated for a fixed interval of time which is independent of the duration and amplitude of said signal.

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