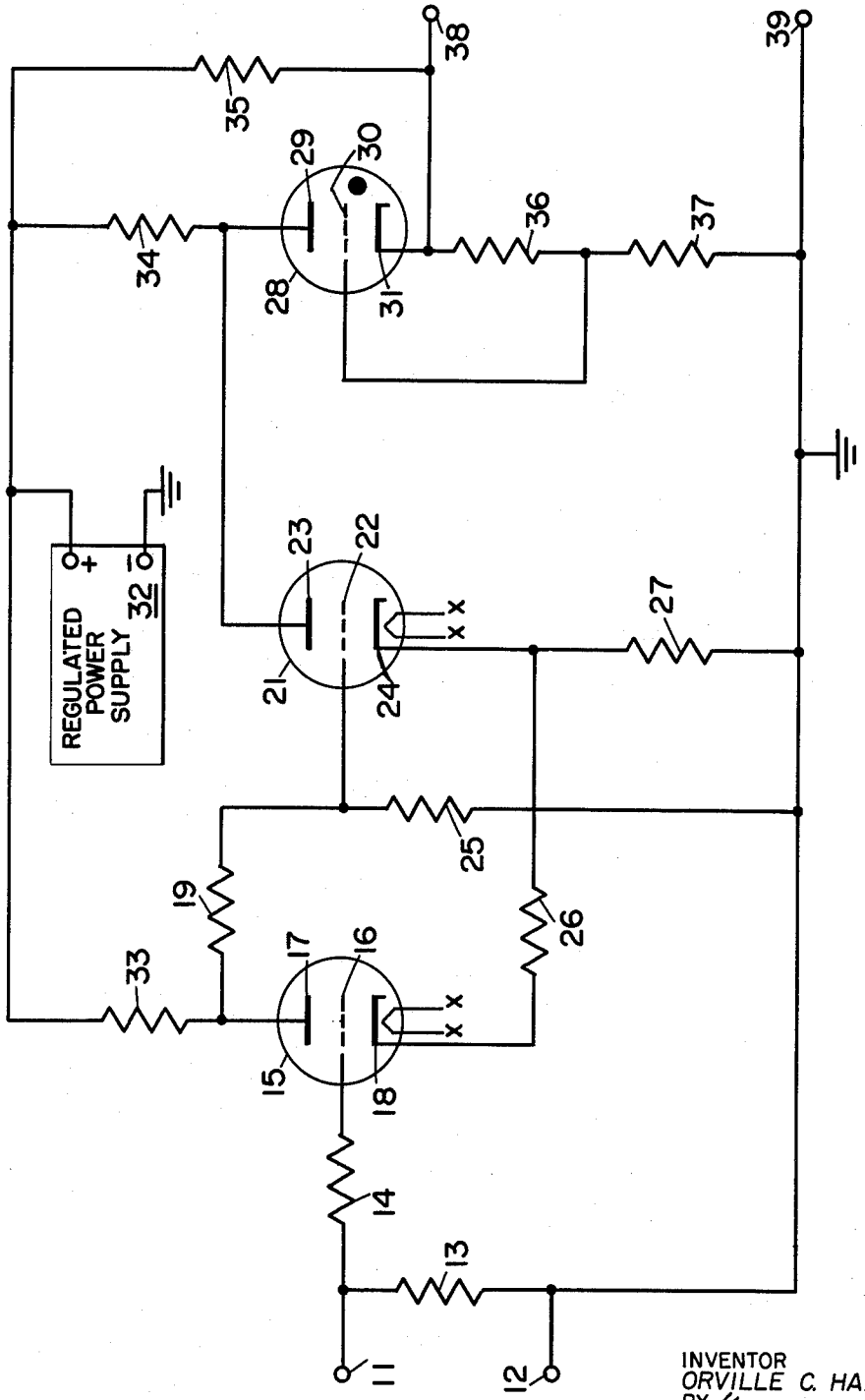
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VOLTAGE LIMITER

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VOLTAGE LIMITER

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This invention relates to voltage limiters and more particularly to voltage limiters in which the limited voltage is unaffected by changes in the supply voltage.

In systems employing frequency shift keying for Teletype operation, a direct keying signal supplies the deviation information. This signal may vary in amplitude and produce and frequency deviation when none is desired. For this reason some type of voltage limiting means must be used at the input to the frequency shift control apparatus. The usual vacuum tube limiters suffer from changes in gain as functions of both anode supply and filament supply voltages. A change in gain of the limiter results in a variation in the limited level of the output voltage, and affects the frequency shift control apparatus to produce an unwanted frequency deviation. Although stable anode supply voltages are readily attainable through the use of regulated power supplies, the same is not the case for the filament or alternating voltage supplies.

It is an object of this invention to provide a new and improved voltage limiter.

Another object of this invention is to provide an improved voltage limiter in which the limiting level is not affected by variations in filament supply voltages.

Other objects and advantages of the invention will hereinafter become more fully apparent from the following description of the annexed drawings, which illustrate a preferred embodiment, and wherein the single figure of the drawing is a diagram of the circuit of this invention.

Referring in detail to the single figure of the drawing the reference numerals **11** and **12** designate input terminals to which signals to be limited are applied and across which a resistor **13** is connected. A resistor **14** connects the input terminal **11** to a control grid **16** of a vacuum triode **15** which also contains an anode **17** and a cathode **18**. The output signal is taken from the anode **17** and is fed through a resistor **19** to a control grid **22** of a second vacuum triode **21** which contains an anode **23** and a cathode **24**. A grid resistor **25** connects the control grid **24** to ground. The cathode **18** of the triode **15** is coupled by a resistor **26** to the cathode **24** of the triode **21** and the two cathodes are connected to ground by a cathode resistor **27**. A thyratron **28** having an anode **29**, a control grid **30** and a cathode **31** has its anode **29** directly connected to the anode **23** of the triode **21**. A regulated power supply **32** supplies energy to the anode **17** through an anode load resistor **33** and to the anodes **23** and **29** through a common load resistor **34**. A resistor **35** shunts the thyratron **28** and the resistor **34** to maintain a continual bleeder current flow through resistors **36** and **37** which connect the cathode **31** to ground. The control grid **30** is connected to the junction of the resistors **36** and **37** and is biased by the voltage drop across the resistor **36**. The limited output is taken from the circuit by the output terminals **38** and **39**.

In the absence of a positive signal at the terminals **11** and **12**, triode **21** conducts, drawing a current through the common anode load resistor **34**. The voltage drop across

the resistor **34** is sufficient to lower the voltage at the anode **29** of the thyratron **28** below the value necessary for the thyratron **28** to fire. When the thyratron **28** does not conduct, the only current passing through the cathode resistors **36** and **37** is the bleeder current which is carried by the resistor **35**. The voltage output at the output terminals **38** and **39** is low. When a positive signal appears at the input terminals **11** and **12**, the conduction through the triode **15** increases, increasing the bias applied to the triode **21** by the cathode resistor **27** and cutting-off the triode **21**. The voltage at the anode **29** of the thyratron **28** then rises and the thyratron **28** fires. Current flow through the resistors **36** and **37** increases and the output voltage at the terminals **38** and **39** increases to a second higher value.

Since the power supply **32** is regulated, current flow through the resistors **36** and **37** in each condition of the thyratron **28** is constant. Since the thyratron **28** is a cold cathode tube, there is no filament voltage to introduce distortion into the output signal.

The described device produces two regulated output voltages for two conditions of input signals. Since a regulated power supply is utilized and the filament voltage for the final stage has been eliminated, the two most common causes of voltage distortion in limiters are not present.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A voltage limiter comprising a gas filled electron tube having a cold cathode and an anode, first resistor means connected in series with said cathode, a regulated power supply to supply energy to said gas tube, a second resistor connecting the positive side of said power supply to said anode, a third resistor connecting the positive side of said power supply to the junction between said cathode and said said first resistor means, the negative side of said power supply being connected to the end of said first resistor which is remote from said cathode, means connected to said anode for preventing said gas tube from conducting in the absence of an input signal, means for rendering said gas tube conductive in the presence of a positive input signal, and output terminals connected across said first resistor means whereby a first constant output voltage other than zero is applied to said output terminals in the absence of an input signal and second constant output voltage is applied to said output terminals in the presence of a positive input signal.

2. The voltage limiter described in claim 1 in which said means for preventing said gas tube from conducting comprises a first vacuum tube having a first anode and a first cathode, and a fourth resistor connected in series with said first cathode, said first anode being connected to the junction of said second resistor and said anode of said gas tube whereby the voltage applied to said gas tube anode is reduced when said first vacuum tube conducts.

3. The voltage limiter described in claim 2 in which said means for rendering said gas tube conductive comprises a second vacuum tube having a second anode, a second cathode and a second control grid, and means for injecting an input signal into said second control grid, said second cathode being connected to the junction of said first cathode and said fourth resistor whereby conduction through said second vacuum tube initiated by a positive input signal biases said first vacuum tube beyond cut-off.

4. A voltage limiter comprising a first vacuum tube having a first anode, a first cathode, and a first control

grid; a second vacuum tube having a second anode and a second cathode; means for injecting an input signal into said first control grid; said first cathode being connected to said second cathode; a first resistor connecting said first and said second cathodes to ground; a gas tube having a third anode and a third cathode; said second anode being connected to said third anode; a regulated power supply having a first terminal and a second terminal; said first terminal being connected to ground; a second resistor connecting said second anode and said third anode to said second power supply terminal; a third resistor connecting said third cathode to ground; a fourth resistor connecting said second power supply terminal to the

junction between said third resistor and said third cathode; and output terminals connected to the junction of said third resistor and said third cathode and to ground.

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