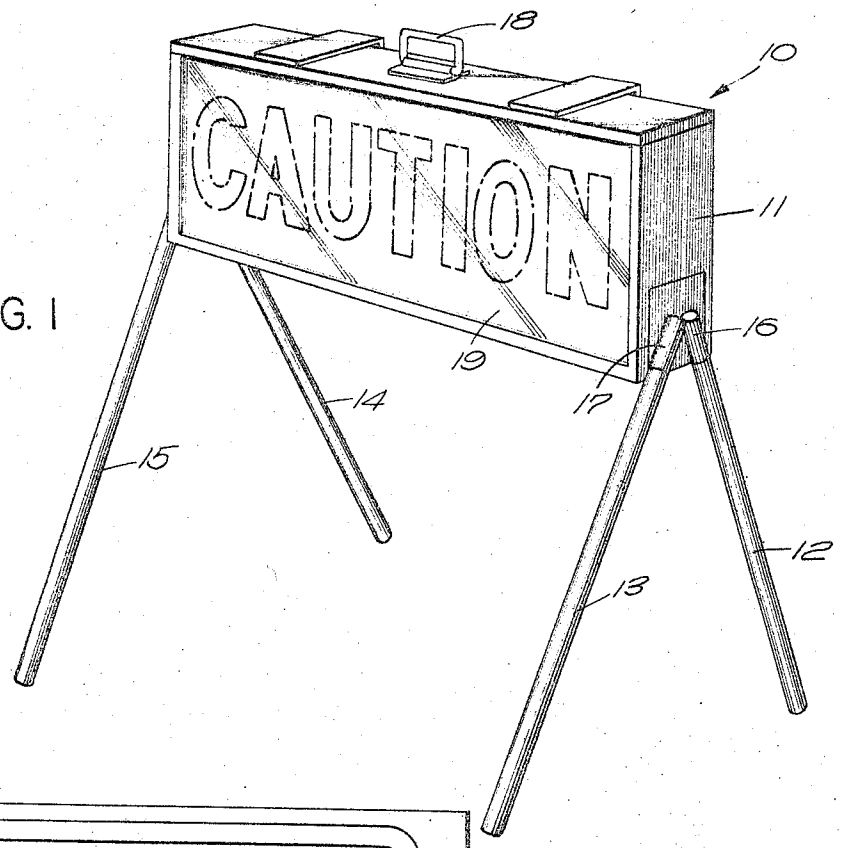
Feb. 11, 1969 F. L. HARNEY, JR., ET AL 3,427,500

FLASHING SIGNS HAVING TRANSISTORIZED OSCILLATOR CIRCUIT

Filed July 30, 1964

FIG. 1



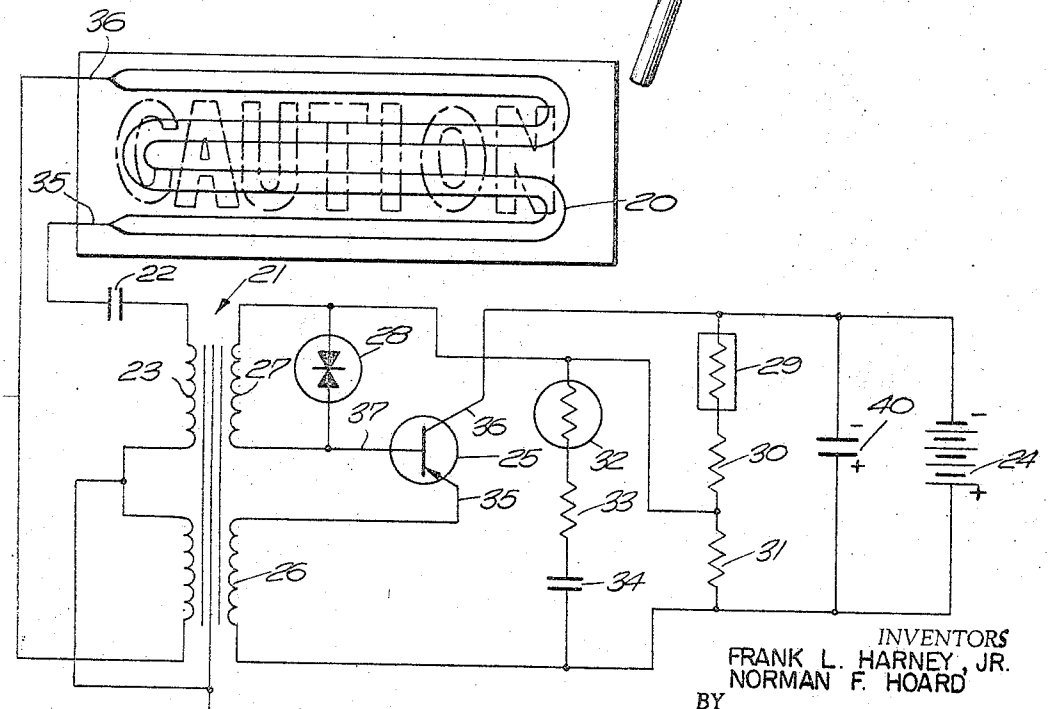


FIG. 2

INVENTORS
FRANK L. HARNEY, JR.
NORMAN F. HOARD

BY

Weingarten, Oronbrck & Lakive

ATTORNEYS

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FLASHING SIGNS HAVING TRANSISTORIZED OSCILLATOR CIRCUIT

Frank L. Harney, Jr., 190 Lowell Road, Wellesley Hills, Mass. 02181, and Norman F. Hoard, 27 Wendell Park, Milton, Mass. 02186

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ABSTRACT OF THE DISCLOSURE

An illuminated sign designed to flash at a blink rate designed to capture the attention of the observer. This sign is battery operated and uses a transistorized circuit to intermittently energize a gaseous discharge lamp.

This invention relates generally to illuminated signs and more particularly relates to a battery operated, transistorized, portable, illuminated and flashing sign having a novel transistorized circuit and a unique gaseous discharge lamp.

The present invention is related to the field of illuminated safety and warning signs and in particular is directed toward a self-contained, portable, battery operated, transistorized, warning and control sign that economically transmits its safety message or warning continuously at a blink rate designed to capture the attention of the observer. The device as described herein is highly dependable, more economical and more practical than known in the prior art. The device further has an exceptionally long life, needs little maintenance and may be exposed to all types of weather conditions for extended periods without deleterious effects. These and other features of the present invention are achieved through the use of a unique, highly efficient, cold cathode, all weather fluorescent-type gaseous illumination source or lamp in conjunction with a highly dependable transistorized circuit especially designed for the present application. The invention has further features in that the face thereof is designed to be readily interchangeable so that any type warning or control message may be displayed thereon. Other and further advantages of the present invention will be better understood when considered in conjunction with the following drawings in which:

FIG. 1 is a perspective view of one embodiment of the present invention; and

FIG. 2 is a schematic diagram of the electrical system including the illumination source used therein.

Referring now to FIG. 1, there is shown a perspective view of the sign **10** which generally illustrates the external physical characteristics of the invention when it is used as a portable highway sign. All electrical and illuminating means are contained within a sturdy rectangular housing **11** formed with an opening therein, which opening is covered with a transparent means displaying a legend thereon.

More specifically, housing **11** is seen to comprise a rectangular box of suitable size formed of sheet steel and having supporting means such as legs **12, 13, 14** and **15** attached thereto. The opening in case **11** is formed such that a transparent face plate **19** may be fixed over the opening in case **11**. Since such a device may be exposed to all weather conditions, case **11** may be made weatherproof by sealing of its seams and by the liberal use of weather stripping around the face plate **19**. In order to service the interior components without disturbing face plate **19**, case **11** may be provided with a rear access panel (not shown).

Referring once again to legs **12, 13, 14** and **15**, it is

seen that such legs may be attached to case **11** by any suitable means. One such means is shown as brackets **17** and **16** which are hollow cylindrical tubes closed at one end and secured such as by welding to each end of case **11**.

For portability of the device **10** such legs should fit snugly into their respective brackets but be readily removable, and a handle **18** should be provided on the upper surface of case **11**.

In place of legs **12, 13, 14**, and **15** and their respective brackets, the case could be provided with another supporting means such as eyebolts provided in the upper surface so that it may be suspended by a chain or by bolting on a wall or other horizontal surface.

The face plate **19** consists of a transparent sheet covering the opening in case **11** and having a legend displayed thereon. Plate **19** consists of any readily available transparent material such as glass or plastic. Because of the likelihood of breakage when the device is used in exposed places, such as a highway, the plate should consist of a high impact plastic having a high coefficient of light transfer with minimum deterioration under continuous exposure to the ultraviolet radiation emitted by the sun. One particular material found suitable is cellulose acetate butyrate formed in sheets .080 inch thick.

The message displayed on the face plate **19** may be of any particular shape, form, or color to best convey the desired information. The size of the letters used will, of course, depend upon the length of the message. The words, "Caution," "Danger," "Accident," "Slow," "Detour," "One-Way," "Open Trench," "Keep Right," etc. are only a few of the messages available to alert and warn the observer. Such messages may be produced in the face plate **19** by well known methods such as by vacuum forming. However other means may also be used since the length or form of the message may require them.

FIG. 2 discloses the specific details of the novel transistorized circuit and unique illuminating means used in the sign **10**. The circuit is basically an oscillator designed to produce pulses capable of flashing lamp **20** on and off forty times per minute. This flash or blink rate has been found to best capture the attention of the observer. Such actuation of lamp **20** is accomplished by coupling the lamp **20** to an oscillator circuit through a tuned circuit and transformer **21** selected to provide a secondary voltage of about 7500 volts. A satisfactory tuned circuit comprises capacitor **22** and the secondary winding **23** of transformer **21**.

The oscillator circuit now to be described consists of a voltage source **24** coupled to transistor **25** through the primary **26** of transformer **21** and a feedback circuit coupled to a voltage divider network and the base **37** of the transistor.

This oscillator operates in the following manner. When the transistor **25** is of the PNP type a positive voltage from source **24** is applied to emitter **35** through winding **26** and the base is normally biased slightly negative by means of a voltage divider network consisting of resistors **29, 30** and **31**. This negative bias to base **35** permits a positive starting of the oscillator with a fast pulse rise time when capacitor **40** is maintained across source **24** to reduce its effective impedance. The duration of the series of oscillation pulses is determined by resistors **32** and **33** and capacitor **34** located between primary **26** and tertiary **27**, for when the charges on capacitor **34** accumulate to the point where it exceeds the negative voltage appended to base **37**, the transistor **25** shuts off. Once transistor **25** shuts off, the charges on capacitor **34** begin to bleed off through the voltage divider network to ground. When the charges on capacitor **34** fall below the negative bias applied to base **37** by the voltage divider net-

work, the transistor **25** turns on and charge once again begins to accumulate on capacitor **34** to repeat the cycle.

A number of improvements is also shown in this figure. For example, a double base Zener diode **28** is connected in parallel with winding **27** in order to stabilize the circuit by limiting the maximum feed back voltage applied to base **37**. Resistor **32** is preferably a thermistor in order to stabilize the circuit over a temperature range of —20° F. to +130° F. and resistor **29** is voltage variable to compensate for decreasing voltage from source **24** caused by continued use. A variable resistor may be substituted for fixed resistor **30** to provide an easily adjustable flash or blink rate. The range of adjustment may be limited by the use of a fixed resistor in series with the variable resistor to restrict the flash or blink rate within usable range.

As previously mentioned, the above-described circuit is used in conjunction with the unique lamp **20**. Lamp **20** is an elongated hollow cylindrical or tubular, gas filled, body, of a transparent dielectric such as glass, sealed at either end with electrodes **35** and **36** and having a fluorescent coating deposited on its interior surfaces. The fluorescent coating used may be a phosphor of barium titanium phosphate preferably deposited on its interior surfaces by any convenient method such as the flotation lacquer filming process which provides a smooth uniform coating of the phosphor. The gas filling used in the lamp should be one of the noble inert gases such as xenon. In the preferred embodiment, the lamp **20** is made, for example, of a tubing 12 feet long having an inner diameter in the order of 12 to 15 mm., arranged in a grid fashion, filled with xenon at a pressure of about 50 microns and having iron electrodes **35** and **36** fitted to the ends thereof. This length, diameter and pressure provides an impedance of about 50,000 ohms for which the previously described circuit was designed. The described lamp **20** has a high efficiency of emitted visible light when high voltage pulses in the order of 7500 volts peak at a repetition rate of 1000 to 1500 pulses per second are applied to the electrodes **35** and **36**. Because of the low gas pressure and physical size of the tube being used, ionization of the xenon gas occurs and the resultant electron beam is not constricted thus permitting direct electron bombardment of the fluorescent phosphor coating in addition to excitation of the coating by the emission spectrum of the gas itself. This direct electron bombardment of the phosphor without constriction of the beam as well as excitation by the emission spectrum of the gas provides a high efficiency of emission of visible light during intermittent operation that has heretofore been unavailable. This tube is capable of operation over a temperature range of —20° F. to 130° F.

The described pressure in the tube may be varied within wide limits. For example, it has been found that the pressure may be varied from 20 to 100 microns. Since maximum visible light emission occurs at a pressure of 20 microns when the pulse repetition rate is in the order of 1200 pulses per second, this pressure is most desirable.

However, this optimum pressure is difficult to maintain and in practical embodiments a pressure of 50 microns is used. It has further been found that satisfactory operation of the tube is obtained over a broad range of peak striking voltages of 5,000 to 10,000 volts and peak ionization current limited to 10 to 20 milliamperes. The circuit previously described meets these requirements and when it produces an intermittent train of unidirectional high voltage pulses approximately 30 microseconds wide with the repetition rate in the order of 1200 pulses per second, the lamp flashes at the optimum rate of 40 flashes per minute which has been found to best capture the notice of the observer.

Other and further variations within the scope of this invention will occur to those versed in the art. It is accordingly desired that the appended claim be given a broad interpretation commensurate with the scope of the invention within the art.

What is claimed is:

1. An electronic system comprising, a gas discharge lamp, a constant voltage source, a voltage divider network, a transistor having base, emitter and collector electrodes, a transformer having primary, secondary and tertiary windings, said primary winding in series with the voltage source and across the emitter and collector electrodes of said transistor and in parallel with the voltage divider network and a first capacitor, said voltage divider network comprising a thermistor and at least one resistance, a second capacitor in series with the secondary winding of the transformer and said lamp, a feedback loop to said base consisting of said tertiary winding in parallel with a double base Zener diode and a thermistor, resistor, capacitor combination and in series with a portion of said voltage divider network and said primary winding, said transistor being of the blocking type pulse oscillatory class using inductive feedback with its period determined by the time constant of the base resistor-capacitor combination whereby said discharge lamp is periodically excited as a series element of said secondary winding.

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ROBERT SEGAL, *Primary Examiner.*

PALMER C. DEMEO, *Assistant Examiner.*

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