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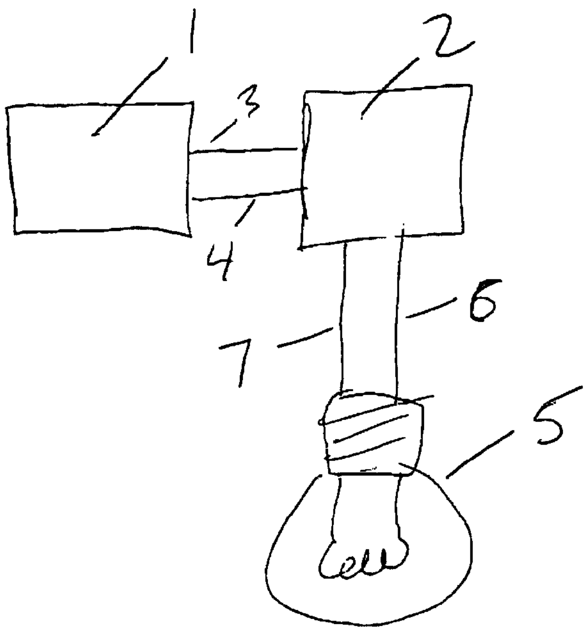
(54) **METHODE DE REDUCTION DE LA CONSOMMATION DE PUISSANCE D'UNE LAMPE FLUORESCENTE OU A SODIUM**

(54) **METHOD FOR REDUCING THE POWER CONSUMPTION OF A FLUORESCENT OR SODIUM LAMP**



(57) A method and apparatus are provided for controlling the electrical power supply to an fluorescent light source or bulb. The method comprises modifying the power supply with a pulse train. Parameters of the pulse train are selected in accordance with an algorithm. At least one parameter, for example frequency, pulse width or voltage, can be selected an optimized to improve the efficiency of the light bulb, whereby greater visible light is produced for a given electrical input.

Title: METHOD FOR REDUCING THE POWER CONSUMPTION OF A FLUORESCENT OR SODIUM LAMP

FIELD OF THE INVENTION

This invention relates to a method and apparatus for delivering power to a fluorescent lamp, a sodium lamp or any other. This invention more particularly is concerned with a method and apparatus for powering a fluorescent light source other than an incandescent electrically powered light bulb. The applicability of the invention to incandescent light bulbs is covered in a separate application, by the same inventor and filed simultaneously herewith.

BACKGROUND OF THE INVENTION

Fluorescent light bulbs are a common and much used source of light. With modern technology, fluorescent light bulbs are relatively cheap and inexpensive to manufacture.

Commonly, a fluorescent light bulb has mercury vapour contained within a glass enclosure. In use, an electric current is passed through the mercury vapour to ionize the vapour. This in turn excites a fluorescent coating on the glass, to produce visible light.

It is well known that the spectrum of radiation produced is dependent upon a number of factors. While the efficiency is much higher than an incandescent light bulb, still a large proportion of the input electrical energy is radiated in portions of the electromagnetic spectrum outside the visible spectrum.

This is highly undesirable. However, conventionally, it has simply been accepted that the physics of such fluorescent light bulbs imply certain losses and inefficiencies.

Commonly, fluorescent light bulbs are powered from an electrical, alternating supply. In North America, this is usually a 120 V supply at a 60 Hz frequency.

The above principles apply, in many respects, to other electrically-powered light sources, including sodium lamps. All of these light sources exhibit some degree of inefficiency and offer the possibility of improving the efficiency.

SUMMARY OF THE INVENTION

What the present inventor has realized is that it is possible to modulate or modify the signal supplied to a light source, such as a fluorescent light bulb or a sodium lamp, to improve its performance. This modulation can be applied to either an alternating current or a direct current signal.

In effect, it has been discovered that if the power supplied to the light bulb is supplied as a train of pulses, then this can significantly affect the behaviour of the light bulb. More particularly, it has been found that characteristics of a pulse train, such as frequency, pulse width and pulse height, can be selected to optimize the performance of a light bulb or lamp.

The exact reasons for this are not well understood. However, it has been found that, with selection of appropriate parameters, the percentage of radiation given out as visible light can be enhanced considerably. In effect, this enables a light bulb to be run at a lower nominal power rating, while producing the same amount of electrical power. This in turn means that less power is wasted.

In accordance with a first aspect of the present invention, there is provided a method of controlling a power supply to a fluorescent light source, the method comprising:

(1) providing an electric power supply;

(2) modulating the electric power supply with a pulse train;

(3) supplying the pulse train to an electrically-powered light source; and

(4) selecting at least one of the frequency, pulse width and voltage of the pulse train, to improve the efficiency of the light source.

The method can be applied to one of a fluorescent light bulb and a sodium lamp, for example.

In accordance with another aspect of the present invention, there is provided an apparatus for controlling the power supply to a light source, the apparatus comprising:

an input for an electric power supply;

a first electronic control unit connected to the input, for receiving the electric power supply, for generating a pulse train to modulate the power supply and having an output for a power supply modulated by the pulse train; and

a connector means for connection to an electric light source and connected to the output of the first electronic control unit for receiving the pulse train.

BRIEF DESCRIPTION OF THE DRAWING FIGURE

For a better understanding of the present invention, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawing, which shows a preferred embodiment of the present invention, and in which:

Figure 1 is a schematic view of an apparatus in accordance with the present invention; and

Figure 2 is a graph showing an exemplary pulse train over one period.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a voltage source 1 connected to an electronic control unit by wires 3 and 4. The electronic control unit generates a pulse stream or train which is used to modify or condition the power supplied from the voltage source 1.

Commonly, for domestic and industrial applications, the voltage source will be an alternating current source, for example a 120 V, 60 Hz supply as used throughout North America. However, it is equally applicable to a DC source.

The electronic control unit 2 is connected to a fluorescent light bulb 5, by wires 6 and 7. Other standard elements of a fluorescent light bulb are omitted for simplicity. Also, the bulb 5 could be a sodium lamp. The light bulb 5 is shown schematically, and it will be understood by those skilled in the art that, commonly, the wires 6 and 7 will be connected to a fixed, light fixture, providing a socket into which the light bulb 5 is itself mounted.

The signal supplied to the light bulb 5 is modified by the pulse train, which has characteristics of pulse width, voltage and frequency. At least two of these characteristics or parameters are modified, in accordance with the present invention, and possibly modification of one may be sufficient. Thus, one of the parameters could be held constant and the other two varied. The two varied parameters could be: frequency and voltage; frequency and pulse width; or the pulse width and voltage. Alternatively, all three parameters, namely the frequency, pulse width and voltage can all be modulated and varied, to control the power transferred to the light bulb.

It has been found that, by extensively varying these parameters and monitoring light generated by the bulb 5 in the visible spectrum, an algorithm can be developed, relating these three parameters and the power supplied, to the amount of visible light generated.

The attached figure 2 shows an exemplary profile of the pulse train or signal provided by the electronic control unit 2. This shows a single period or cycle 20, and it will be understood that this period 20 is repeated to form the continuous signal.

Within the period 20, there are five pulses, indicated at 21, 22, 23, 24, and 25. The pulses are spaced by intervals indicated as λ_1, λ_2, λ_3, λ_4, λ_5. The specific values for these pulses in this example are:

Pulse No.	**Voltage**	**Duration of Pulse (Pulse Width)**	**Pulse Interval**
21	50	10	λ_1=10
22	55	7	λ_2=12
23	60	12	λ_3=8
24	57	9	λ_4=10
25	48	9	λ_5=12

As indicated at the right hand side, at 21′, the next period has the same sequence of pulses.

As this table shows, within the period 20, all the parameters of the pulses, namely frequency (i.e. inverse of the pulse interval), pulse width or duration, and pulse height (voltage) are varied. This gives a distinct pulse profile for the period, and this is repeated in following periods. In general, depending on the particular application, it may not be necessary to vary all three parameters, and it may be sufficient to vary just two of them, or even just one of them, with the other(s) being kept constant. Additionally, it will be understood that the absolute magnitude of each of these parameters can vary greatly depending upon the actual application.

Additionally, these parameters were developed for an incandescent bulb, and it will be understood that suitable values could be chosen for a fluorescent bulb.

It will be appreciated that common fluorescent light bulbs have certain losses and inefficiencies. Some of the power supplied results in generation of ultraviolet or infrared radiation.

Although the mechanism behind the present invention is not fully understood, it is believed that by selection of suitable parameters, a resonance effect is achieved, causing the bulbs to provide a significantly larger proportion of the radiation in the visible region. More specifically, for a fluorescent light bulb, it is believed that one can excite just specific states or quantum levels of the vapour in the bulb or lamp, so that when the electrons return to their ground state, radiation is produced that interacts with the fluorescent coating to produce visible radiation, thereby increasing the percentage of radiation in the visible spectrum. This enables, for example, a normally 40-watt bulb to be driven with significantly less than 40 watts of power, and yet still produce the same amount of visible light.

CLAIMS:

1. A method of controlling a power supply to a fluorescent light source, the method comprising:

(1) providing an electric power supply;

(2) modulating the electric power supply with a pulse train;

(3) supplying the pulse train to an electrically-powered light source; and

(4) selecting at least one of the frequency, pulse width and voltage of the pulse train, to improve the efficiency of the light source.

2. A method as claimed in claim 1, when applied to one of a fluorescent light bulb and a sodium lamp.

3. An apparatus for controlling the power supply to a light source, the apparatus comprising:

an input for an electric power supply;

a first electronic control unit connected to the input, for receiving the electric power supply, for generating a pulse train to modulate the power supply and having an output for a power supply modulated by the pulse train; and

a connector means for connection to an electric light source and connected to the output of the first electronic control unit for receiving the pulse train.

4. An apparatus as claimed in claim 3, in combination with one of a fluorescent light bulb and a sodium lamp, as the light source.

ABSTRACT OF THE DISCLOSURE

A method and apparatus are provided for controlling the electrical power supply to an fluorescent light source or bulb. The method comprises modifying the power supply with a pulse train. Parameters of the pulse train are selected in accordance with an algorithm. At least one parameter, for example frequency, pulse width or voltage, can be selected an optimized to improve the efficiency of the light bulb, whereby greater visible light is produced for a given electrical input.

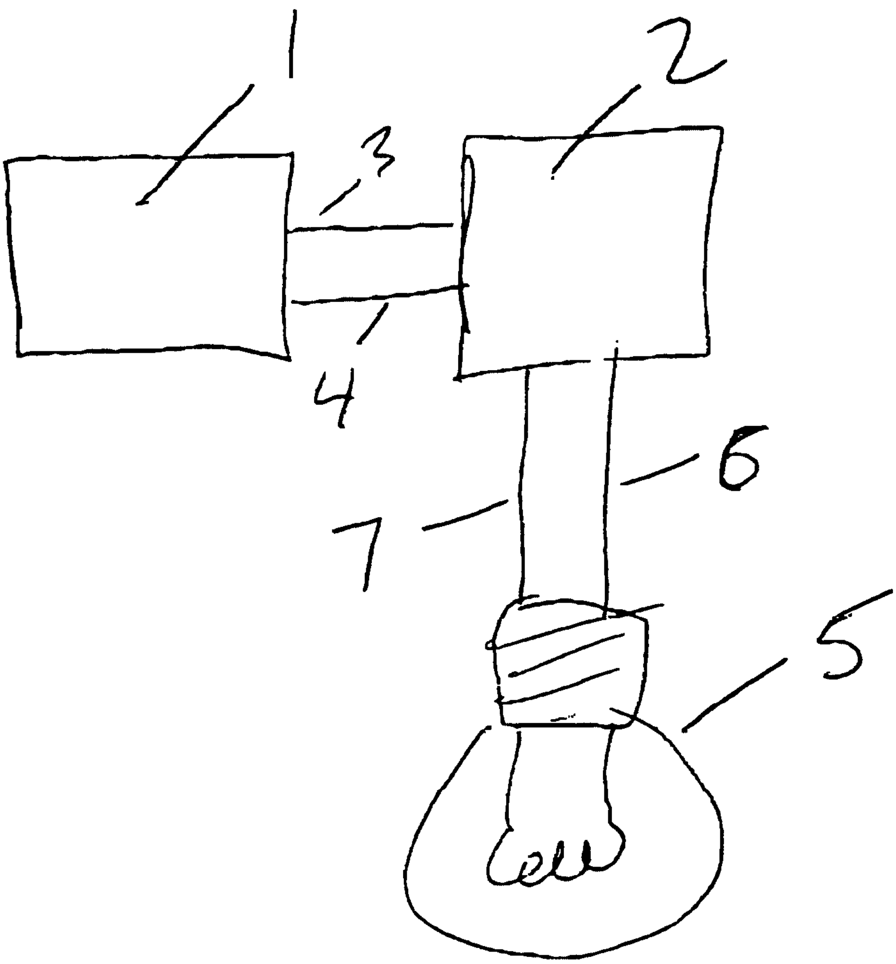


FIGURE 1

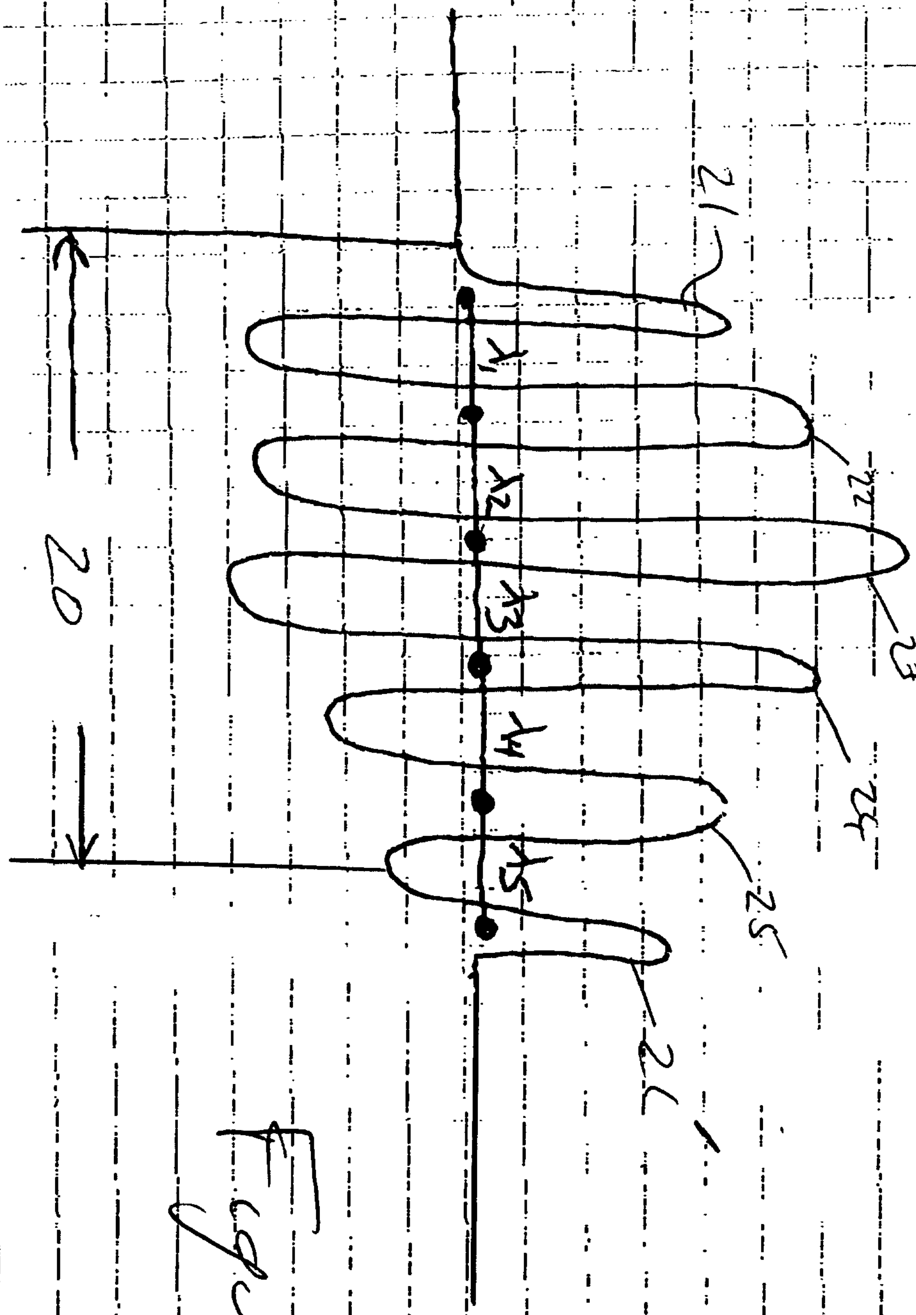


Figure 2