United States Patent [19]

Banks

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[54] **LAMP FLASHER**

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[52] **U.S. Cl.** ..... **315/200 A,** 307/252 B, 315/205, 315/209

[51] **Int. Cl.** **H05b 37/00**

[58] **Field of Search** ..... 307/252 B, 252 N, 252 VA, 307/252 W; 315/200 R, 200 A, 205, 209

[56] **References Cited**

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[57] **ABSTRACT**

A plurality of incandescent lamps, such as those used in an illuminated display sign, are energized from an A.C. power source via a triac connected in series with each lamp. The firing angle of each triac is controlled by a free-running multivibrator having a frequency very close to, but different from, the frequency or a harmonic of the A.C. power frequency. Therefore, the power applied to the lamps is gradually increased or decreased in a repetitious and periodic manner to create an eye-catching effect and also to increase the lifetime of the filaments of incandescent lamps.

5 Claims, 3 Drawing Figures

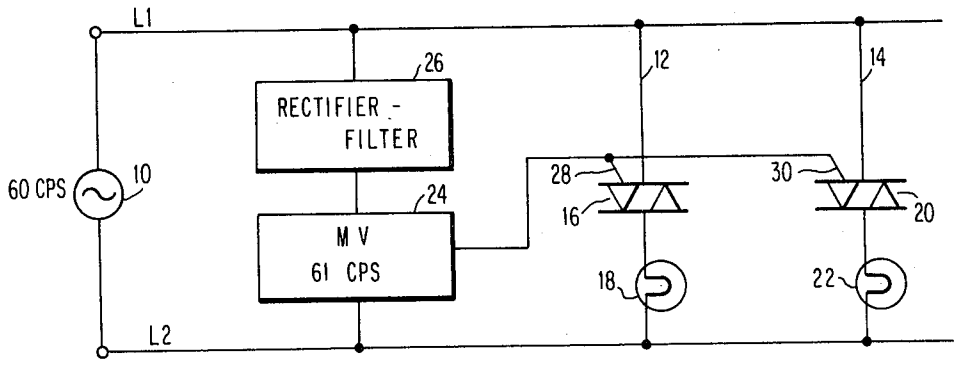


FIG. 1

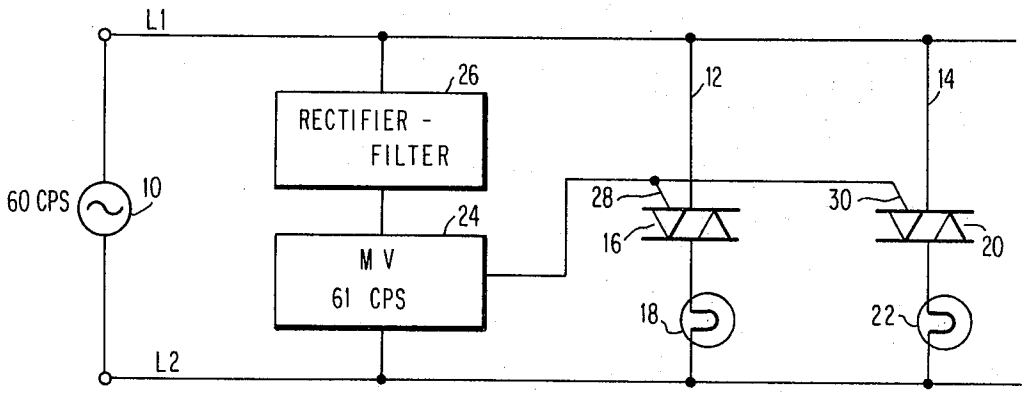


FIG. 2A

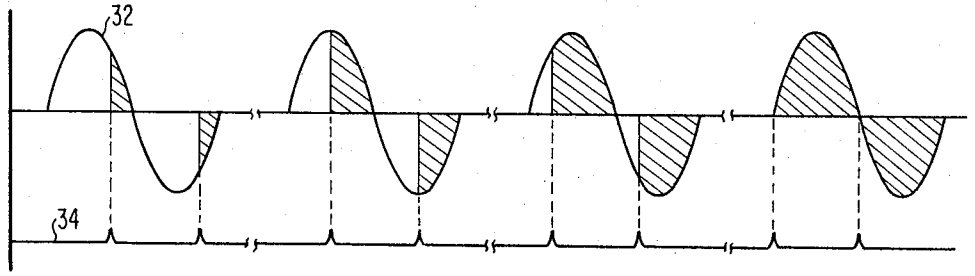
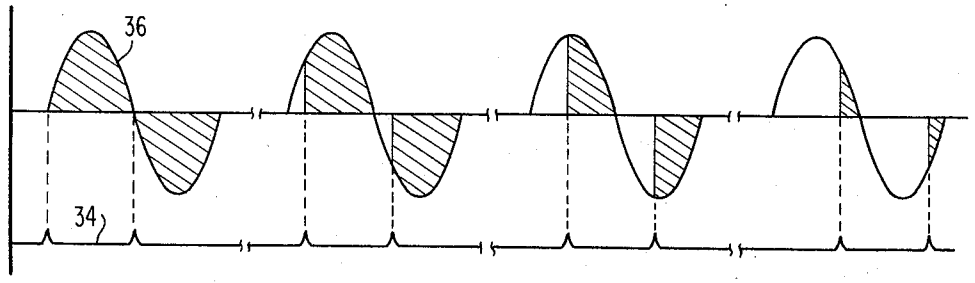


FIG. 2B



LAMP FLASHER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates both generally to the field of periodic A.C. power modulators and also more particularly to the field of incandescent lamp flasher circuits.

2. Description of the Prior Art

Incandescent lamp flasher circuits are, of course, known in the prior art, but these circuits are of the type in which the lamps are simply abruptly and completely turned on and off to give the effect of a blinking electric light sign, for example.

SUMMARY OF THE INVENTION

The general object of the invention is to provide a novel, periodic A.C. power modulator wherein the power applied to a load from an A.C. source is repetitiously and periodically gradually increased or decreased.

A more specific object of the invention is to provide a means for periodically and repetitiously modulating the power of an A.C. source by means of a semiconductor switch which is controlled by switching pulses having a frequency very close to, but different from, the frequency of the A.C. power source or a harmonic thereof.

Another specific object of the invention is to provide a novel incandescent lamp flasher circuit wherein the power applied to an incandescent lamp sign comprising a plurality of lamps is gradually increased or decreased in a repetitious and periodic manner in order to provide an eye-pleasing effect.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of the preferred embodiment of the invention wherein A.C. power applied to a plurality of incandescent lamps is periodically and repetitiously varied;

FIG. 2A is a waveform showing the manner in which the load voltage is repetitiously and periodically modulated when the switching frequency is slightly higher than the power source frequency; and

FIG. 2B is a waveform illustrating the voltage applied to the load when the switching frequency is slightly lower than the power source frequency.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A pair of power lines L_1 and L_2 are connected across a source **10** of A.C. power, such as conventional house current of **110** volts at **60** cycles per second.

Connected across lines L_1 and L_2 are a pair of series circuits **12** and **14.** Circuit **12** consists of a triac **16** and an incandescent lamp **18,** and circuit **14** consists of a triac **20** and an incandescent lamp **22.** Two such series circuits are shown only for exemplary purposes, and it is understood that any number of such series circuits may be connected across the power lines.

Also connected across lines L_1 and L_2 is a free-running square wave multivibrator or oscillator **24.** Connected in series with the multivibrator **24** is a rectifier-filter **26** for rectifying and smoothing the A.C. voltage so that D.C. is applied to the multivibrator.

In the circuit illustrated in FIG. **1,** the frequency of the multivibrator is chosen to be 61 cycles per second. However, it is to be understood that the frequency of the multivibrator can be either greater or smaller than the frequency of the source **10,** as will be described in more detail below. Furthermore, the difference between the power frequency and multivibrator frequency is typically in the range from just greater than 0 to 3 cycles per second. In other words, for a power frequency of 60 cycles per second, the multivibrator frequency may range from 57 to 63 cycles per second but excluding exactly 60 cycles per second.

The output of the multivibrator is connected to the gates **28** and **30** of triacs **16** and **20,** respectively, so that the triacs are switched on in unison by the differentiated output square wave from the multivibrator, thereby progressively switching A.C. power to lamps **18** and **22.** The triacs, as usual, switch off each half cycle at the zero crossing of the load current waveform. The gradual increase or decrease of load power applied to the lamps is repeated over and over, thereby creating an effect which, in an electric light sign for example, is eye-catching. Other applications are, of course, contemplated wherein a load is to be gradually energized. In the case of an incandescent lamp load, as illustrated, the life of lamp filaments will be significantly increased as compared to prior art lamp flashers which simply flash a lamp on and off with a switch, causing high level current transients.

FIG. 2A illustrates the manner in which the A.C. voltage waveform **32** applied to the lamp loads is varied by the differentiated square wave switching waveform **34** of the multivibrator. It can be seen that because of the slight difference in frequency between the multivibrator output and the A.C. power line, the switching waveform creeps, or continually changes its phase, relative to the power waveform in a cyclic and repetitious manner. FIG. 2A illustrates the case when the multivibrator frequency is higher, e.g., 63 cycles per second, than the power line frequency, e.g., 60 cycles per second, whereby the lamp intensity builds up slowly and then cuts off suddenly. FIG. 2B is similar to FIG. 2A but illustrates the case where the multivibrator frequency is lower than the frequency of the A.C. power line waveform **36,** whereby the lamp intensity is gradually decreased and then goes suddenly to maximum value.

Even though this invention is shown in the preferred embodiment as applied to a plurality of incandescent lamps appearing in an electric light sign, for example, in order to provide a repetitious and periodic modulation of the power applied to the lamps in order to produce a continuous cycle of gradually increasing illumination followed by sudden extinction or gradually decreasing illumination followed by sudden energization, the invention is applicable to any load wherein it is desired to periodically and repetitiously modulate or vary the power applied to the load from an A.C. source. Even though in the preferred embodiment, a triac has been illustrated as the modulating device to obtain full wave modulation of the A.C. source, it is to be understood that other switching devices such as an SCR could be used in series with each load, in which case only alternate half-cycles of the A.C. waveform would be modulated.

While the invention has been particularly shown and described with reference to the preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made

therein without departing from the spirit and scope of the invention.

I claim:

1. A power modulator for periodically modulating the power applied to a load from an A.C. power source comprising:

a. controllable A.C. switch means adapted to be coupled between the source and the load, and

b. control signal generator means coupled to said A.C. switch means for continuously generating control signals for controlling the time in each half-cycle of A.C. power at which the switch means is rendered conductive;

c. the frequency at which the control signals are generated being very close to, but different from, the frequency of the A.C. power source or a harmonic thereof, so that the phase difference between successive control signals and corresponding A.C. power cycles continuously and cyclically varies, whereby the A.C. power applied to the load also continuously and cyclically varies.

2. A repetitive power modulator for repetitively and periodically modulating the power of a signal applied from an A.C. source to a load comprising:

a. A.C. phase control means adapted to be coupled between the A.C. source and the load and having a control element responsive to a control signal for becoming conductive at a point in each A.C. cycle, and

b. control signal generating means coupled to said control element and continuously producing a control signal having a frequency different from, but quite close to, the A.C. signal frequency, so that the A.C. power applied to the load is continuously and periodically modulated in accordance with the difference in frequency of said control signals and said A.C. signals.

3. A lamp flasher circuit for continuously and periodically varying both the flashing frequency and illumination intensity of a plurality of lamps wherein the circuit is adapted to be connected between a source of A.C. voltage and the lamps, the circuit comprising:

a. controllable A.C. switch means adapted to be connected between the source and each lamp, and

b. signal generating means for continuously generating control signals for opening and closing of said switch means, the frequency of said control signals being fixed and different from the A.C. voltage frequency or a harmonic thereof, whereby the illumination of said lamps is cyclically and continuously varied from a full intensity condition to an off condition at a frequency equal to the difference between the control signal and A.C. voltage frequencies.

4. A lamp flasher circuit as defined in claim 3 wherein said A.C. switch means comprises a triac.

5. A lamp flasher circuit as defined in claim 1 wherein the difference in said frequency is between zero and three cycles per second.

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