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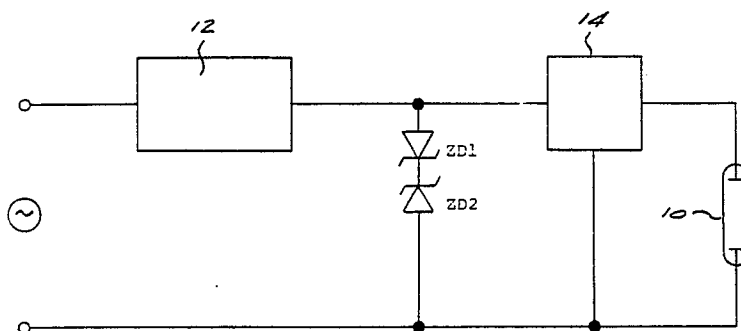
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54 Starting assistance device for a gas discharge lamp.

57 A starting assistance device for use in conjunction with an ignition device 14 for a gas discharge lamp 10 applies high voltage starting pulses to the lamp. The starting assistance device comprises a voltage sensitive solid-state device, such as two zener diodes ZD1 and ZD2 connected in parallel with the ignition device 14, and provides a low impedance return path for the high voltage starting pulses when the ignition device is operating. As soon as the device switches off, the starting assistance device assumes a high impedance state.

Fig. 1



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STARTING ASSISTANCE DEVICE FOR A GAS DISCHARGE LAMP

This invention relates to a starting assistance device for use with a gas discharge lamp.

Gas discharge lamps are normally driven from a source of AC electrical current via a current or voltage regulating device. An ignition device typically applies high voltage pulses to the lamp to ignite it, the ignition pulses being removed once the lamp has been ignited.

To provide a low impedance return path for the high voltage ignition pulses, lamp manufacturers recommended that a starting assistance capacitor be switched into the lamp circuit during the period that ignition pulses are applied to the lamp, but only during this period. This is commonly achieved by connecting a starting assistance device comprising, in series, a capacitor, a resistor, and a switch, in parallel with the lamp. The switch is controlled by a timer or other means, and is closed during the period that ignition pulses are applied to the lamp.

The provision of switches and timers in such a circuit increases its expense and may introduce problems of reliability. It is therefore tempting for manufacturers to omit switches or timers and to leave the capacitor and resistor permanently connected in parallel with the lamp. The effect of this is that a certain amount of power is continuously dissipated by the starting assistance device. In low power applications, this may not be a serious problem. However, where high power, high voltage lamps are used, a suitably rated starting assistance capacitor may dissipate 1000W. This is clearly undesirable.

SUMMARY OF THE INVENTION

According to the invention there is provided a starting assistance device for use in conjunction with an ignition device for a gas discharge lamp, the lamp being driven in use by a source of electrical current and the ignition device being of the kind which applies starting pulses to the lamp which have a higher voltage than the voltage of the source, the starting assistance device comprising at least one voltage-sensitive solid-state device which is placed in circuit with the lamp and the ignition device and which provides a relatively low impedance return path for starting pulses of the ignition device, but which presents a relatively high impedance to the source of electrical current when the ignition device is inoperative.

The starting assistance device may comprise a pair of zener diodes connected in series with opposite polarity, the voltage ratings of the zener

diodes being selected so that they are essentially non conducting at the voltage of the source of electrical current.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block schematic diagram illustrating a first embodiment of a starting assistance device according to the invention; and

Figure 2 is a block schematic diagram of an alternative embodiment of a starting assistance device.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to Figure 1, a gas discharge lamp 10 is arranged to be driven by a source of AC electrical current via a regulating device 12. An ignition device 14 between the regulating device 12 and the lamp 10 provides high frequency, high voltage pulses to ignite the lamp 10. A starting assistance device comprising, in series, two zener diodes ZD1 and ZD2, is connected in parallel with the ignition device 14 between the regulating device 12 and the ignition device 14. The zener diodes ZD1 and ZD2 are connected in series, with opposed polarity, as illustrated.

When the source of electrical current is applied to the illustrated circuit while the lamp is off, the open-circuit voltage at the output of the regulating device 12 will be relatively high, but will not exceed a predetermined threshold level determined by the voltage ratings of the zener diodes ZD1 and ZD2. These zener diodes will thus not conduct.

When the ignition device 14 begins to supply high voltage pulses to the lamp 10, the return path for the high frequency, high voltage pulses has a high impedance through the regulating device 12. This causes the voltage across the starting assistance device to rise until the zener diodes become conductive, thus providing a lower impedance path for the starting pulses. The effect of this is that a greater proportion of the power of the starting pulses is supplied to the lamp, rather than being dissipated in the rest of the circuit. When the lamp starts, the igniter is turned off (either manually or automatically), thus removing the high voltage starting pulses and causing the zener diodes to become non-conductive once more.

Figure 2 shows an alternative embodiment of the starting assistance device. In this embodiment, the starting assistance device comprises a silicon bilateral switch (SBS) 16 of the kind which, once it

has switched into a conductive state, remains in that state while current passes therethrough. Instead of the SBS 16, a pair of silicon controlled rectifiers (SCR's) or a triac can be used. A capacitor C and a resistor R are connected in series with the SBS 16. The purpose of the capacitor is to prevent the SBS 16 from remaining conductive once the lamp 10 has ignited and the ignition device 14 has ceased to provide high voltage starting pulses. The resistor R may be used in order to limit the maximum current passing through the starting assistance device, and may be omitted in most cases. The circuit of Figure 1 will generally not require any current limiting device, since the current ratings of modern semiconductor devices are, in most cases, adequate to the task.

The illustrated starting assistance devices are particularly useful with ignition devices which operate automatically by sensing the voltage applied to the lamp, and eliminate the need for switching or timing devices. The starting assistance device can be incorporated in the ignition device, away from the regulating device. This reduces the possibility of high voltages appearing across the regulating device since the starting assistance device provides a low impedance return circuit path for the high voltage ignition pulses.

Claims

1. A starting assistance device for use in conjunction with an ignition device for a gas discharge lamp, the lamp being driven in use by a source of electrical current and the ignition device being of the kind which applies starting pulses to the lamp which have a higher voltage than the voltage of the source, the starting assistance device being characterised in that it comprises at least one voltage-sensitive solid-state device which is placed in circuit with the lamp and the ignition device and which provides a relatively low impedance return path for starting pulses of the ignition device, but which presents a relatively high impedance to the source of electrical current when the ignition device is inoperative.

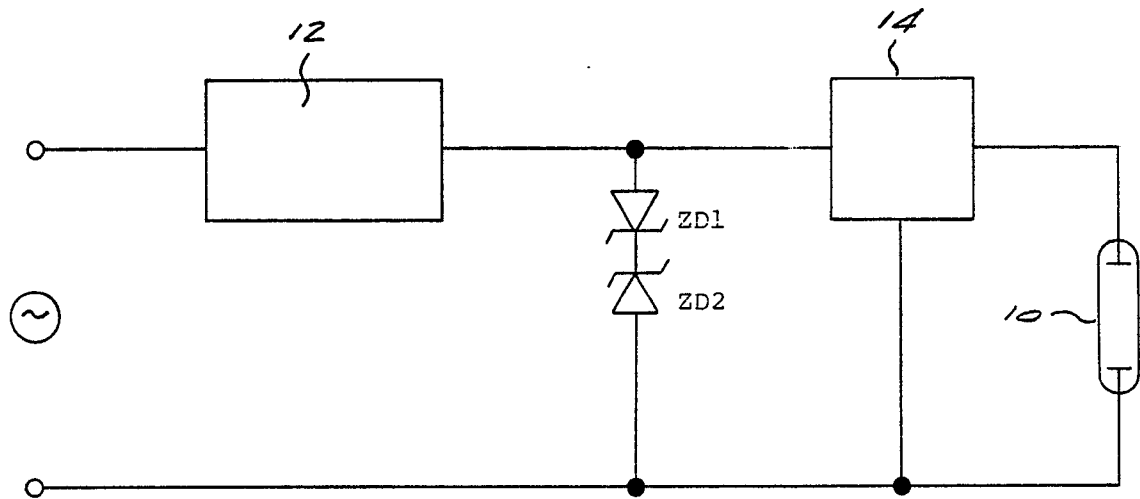
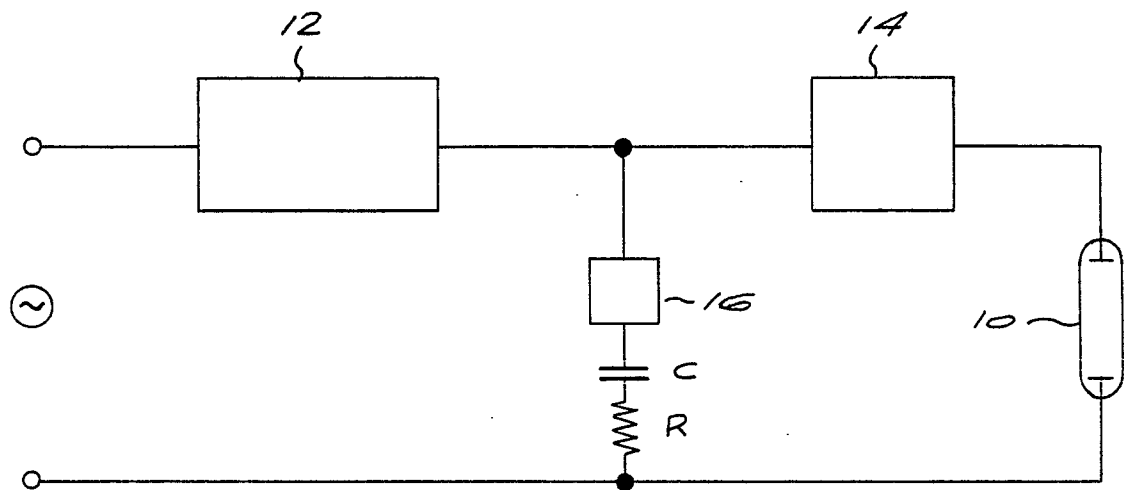
2. A starting assistance device according to claim 1 characterised in that the solid state device comprises a pair of zener diodes connected in series with opposite polarity, the voltage ratings of the zener diodes being selected so that they are essentially non-conducting at the voltage of the source of electrical current.

3. A starting assistance device according to claim 1 characterised in that the solid state device is a switch element of the kind which is maintained in a conductive state by a current passing therethrough, the switch element assuming a conductive

state when the ignition device is producing starting pulses, a capacitor being placed in series with the switch element to cause it to revert to a non-conductive state when the ignition device is inoperative.

4. A starting assistance device according to claim 3 characterised in that a current limiting device is placed in series with the switch element and the capacitor.

5. A starting assistance device according to claim 4 characterised in that the current limiting device is a resistor.

FIG. 1FIG. 2



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-4 339 695 (UNICORN) * Column 4, line 16 - column 4, line 25; figures 1,2 *	1	H 05 B 41/04 H 05 B 41/18
X	US-A-4 240 009 (J.D. PAUL) * Column 4, line 11 - column 4, line 20; figure 1 *	1,2	
X	US-A-4 663 569 (GENERAL ELECTRIC) * Column 4, line 36 - column 4, line 44; figure 3 *	1	
X	EP-A-0 030 785 (ELECO) * Page 6, line 22 - page 6, line 27; figures 1,2,7 *	1	
A	-----	3-5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15-11-1988	Examiner SPEISER P.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	