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NOTICE OF ENTITLEMENT

SKYLINE HOLDINGS AG, of Bernstrasse 61, CH-3072 OSTERMUNDIGEN, SWITZERLAND, the Applicant/Nominated Person in respect of Australian Patent Application No. 65359/90 state the following:-

The Nominated Person is entitled to the grant of the patent because the Nominated Person has entitlement from the actual inventor DANIEL MÜESLLI by assignment.

The Nominated Person is entitled to claim priority from the basic application listed on the patent request form because the Nominated Person made the basic application listed on the patent request form, and because the basic application is the first application made in a Convention country in respect of the invention.

DATED this 5th day of April, 1993.

.....
a member of the firm of
DAVIES COLLISON CAVE for
and on behalf of the
applicant(s).

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PREHEATER CIRCUIT FOR FLUORESCENT LAMPS

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(56) Prior Art Documents
EP 378992
US 4730147
US 4647817

(57)

Fig. 1 is a circuit of a conventional electronic main connecting apparatus and

Fig. 2 is a circuit according to the invention.

Claim

1. Electronic circuit for the preheating of the electrodes (W_1, W_2) of fluorescent lights (FL) for their ignition, which circuit is connected with the outputs ("+", "out" and "0") of an electronic main connecting apparatus (EVG_{11}) and the terminals of the electrodes (W_1, W_2) of the fluorescent light (FL) and to at least one series resonant circuit consisting of a winding (L_{11}) and a first capacitor (C_{22}) as well as a temperature-dependent resistance (PTC_{22}) and a second capacitor (C_{32}), characterized in that the resistance (PTC_{22}) together with the second capacitor (C_{32}) and a first diode (D_1) is connected parallel to the first capacitor (C_{22}) and is connected through a second diode (D_2) with a high voltage output ("+") of the main connecting apparatus (EVG_{11}).

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(81) Bestimmungsstaaten: AT (europäisches Patent), AU, BE (europäisches Patent), BG, BR, CH (europäisches Patent), DE (europäisches Patent), DK (europäisches Patent), ES (europäisches Patent), FR (europäisches Patent), GB (europäisches Patent), GR (europäisches Patent), HU, IT (europäisches Patent), JP, KR, LK, LU (europäisches Patent), NL (europäisches Patent), NO, RO, SE (europäisches Patent), SU, US.

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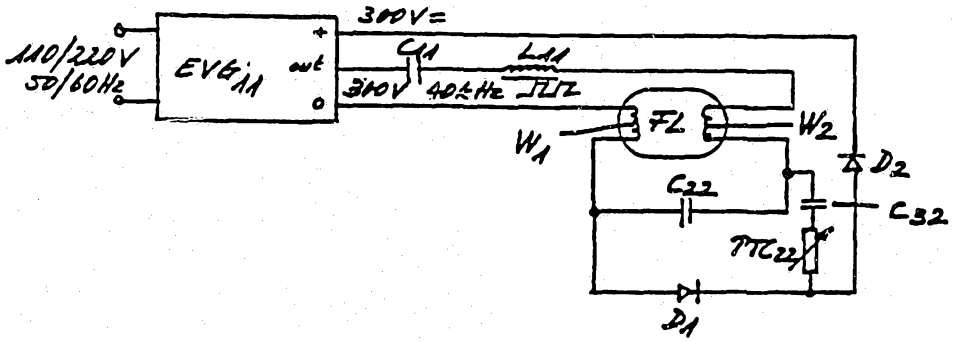
(54) Title: PREHEATER CIRCUIT FOR FLUORESCENT LAMPS

(54) Bezeichnung: VORHEIZSCHALTUNG FÜR FLUORESZENZLAMPEN



(57) Abstract

To eliminate the drawbacks of prior art preheater circuits in older electronic ballasts for fluorescent lamps, i.e. that they consume power unnecessarily and generate heat throughout the time for which the ballast is switched on, the invention proposes a circuit which is switched off once the fluorescent lamp (FL) has struck. The temperature sensitive resistor (PTC_{22}) in series with a potential balancing capacitor ($_{32}$) is connected together with a first diode (D_1) in parallel via a series oscillation circuit capacitor (C_{22}) and via a second diode (D_2) to a high-voltage output ("+") of the ballast (EVG_{11}). Thus, in a first stage after the ballast (EVG_{11}) has been switched on, the incandescent coils (W_1, W_2) of the fluorescent lamp (FL) and the resistor (PTC_{22}) which is low-ohmic when cold are heated so that the latter becomes high-ohmic. This means that in the absence of an ignition current between the incandescent coils (W_1, W_2) the voltage between them rises until it reaches the lamp striking level. After the fluorescent lamp (FL) has struck, the voltage between the incandescent coils (W_1, W_2) falls to the running level. As this is lower than the voltage at the high-voltage output ("+") of the ballast (EVG_{11}), no further current can flow from there via the resistor (PTC_{22}). The first diode (D_1) prevents current from flowing from the "out" output of the ballast (EVG_{11}) via the resistor (PTC_{22}).

(57) Zusammenfassung Um die Nachteile der bekannten Vorheizschaltungen an herkömmlichen elektronischen Vorschaltgeräten für Fluoreszenzlampen zu verhindern, nämlich, dass diese während der gesamten Einschaltdauer des Vorschaltgerätes unnötigerweise Strom konsumieren und Wärme erzeugen, wird erfindungsgemäss eine Schaltung vorgeschlagen, die nach dem Zünden der Fluoreszenzlampe (FL) ausgeschaltet wird. Der mit einem potentialausgleichenden Kondensator (C_{32}) in Serie geschaltete temperaturempfindliche Widerstand (PTC_{22}) wird gemeinsam mit einer ersten Diode (D_1) parallel über den Serieschwingkreis-Kondensator (C_{22}) geschaltet und über eine zweite Diode (D_2) mit einem Hochspannungsausgang ("+") des Vorschaltgerätes (EVG_{11}) verbunden. Dadurch werden in einer ersten Phase nach dem Einschalten des Vorschaltgerätes (EVG_{11}) einerseits die Glühwendel (W_1, W_2) der Fluoreszenzlampe (FL) und andererseits der in kaltem Zustand niederohmige Widerstand (PTC_{22}) erwärmt, derart, dass letzterer hochohmig wird. Dies führt dazu, dass mangels des Nichtfliessens eines Brennstromes zwischen den Glühwendeln (W_1, W_2) die Spannung zwischen letzteren bis zum Erreichen der Lan.penzündspannung ansteigt. Nach dem Zünden der Fluoreszenzlampe (FL) fällt die Spannung zwischen den Glühwendeln (W_1, W_2) bis auf die Brennspannung zusammen. Da dieser kleiner ist als die Spannung am Hochspannungsausgang ("+") des Vorschaltgerätes (EVG_{11}) kann von da her kein Strom mehr über den Widerstand (PTC_{22}) fliessen. Die erste Diode (D_1) verhindert, dass vom "out"-Ausgang des Vorschaltgerätes (EVG_{11}) Strom über den Widerstand (PTC_{22}) fliesst.

PREHEATER CIRCUIT FOR FLUORESCENT LIGHTS

The present invention relates to an electronic circuit for preheating the electrodes of fluorescent lights according to the disclosure part of Patent Claim 1 for the purpose of completely effective and low-abrasion ignition of the fluorescent light.

Electronic main connecting apparatuses for fluorescent lights are known, since without increase of the power supply voltage from the traditional 110 or 220 volts to an ignition voltage of approximately 1000 volts and the increase of the traditional line frequency of 50 or 60 hertz to approximately 30 kHz, a fluorescent light cannot be ignited and operated. As opposed to conventional electrical-mechanical main connecting apparatuses having capacitor and temperature switch, known electronic main connecting apparatuses have the advantage that they are connected with a preheating circuit which in addition to the increase of the lighting voltage makes it possible to attain the ignition point of the electrodes or to heat filaments/incadescent coils of fluorescent lights in such a manner that the electron discharge for the conventional luminous current discharge occurs for ignition of the lights, which protects the fluorescent light and thus allows it a longer life, in other words a greater number of on-off switching cycles.

To be sure, the known preheating circuits have the drawback that they consume current in the range of a half watt during the entire

lighting time of the fluorescent light. In the case of fluorescent lights of normal efficiencies of 40, 60 or more watts an increased consumption of this sort relative to electricity consumption does not fall at all or practically does not fall in the individual lights. Also, the additional heating of the directly adjacent environment around the light which occurs thereby is irrelevant in the case of conventional fluorescent lights. Within the framework of the current by-passes intended for reasons of economy and in use today, and with use of so-called low-power-consumption lights with normal efficiencies of only inconsiderably fewer watts, for instance 7, 10 or 15 watts, but still having light yields comparable to the conventional fluorescent lights, however, both drawbacks are still to be considered, because on the one hand the approximately 0.5 watts lost efficiency of the preheating circuit mean an unnecessary waste of current and on the other hand the additional heating of the electronic mechanism occuring in this case, which electronic mechanism is often built into the light socket in current-saving lights, lead to problems.

Therefore the object of the present invention is to disclose an electronic circuit for preheating the electrodes in a fluorescent light, by means of which effective ignition of the light can be attained and following ignition of the light there is no unnecessary waste of current.

This object is attained according to the invention by a circuit as defined in Claim 1.

One advantageous exemplary embodiment of a circuit of this sort is described hereinafter relative to the drawing, in which this novel device is shown in comparison with a circuit of a conventional electronic main connecting apparatus. In the drawing :

Fig. 1 is a circuit of a conventional electronic main connecting apparatus and

Fig. 2 is a circuit according to the invention.

A conventional circuit is to be seen in Fig. 1, a circuit of an electronic main connecting apparatus EVG_1, of which the input voltage according to the power supply of 110 or 220 volts is at 50 or 60 hertz. A square-wave voltage of approximately 300 V / 40 kHz and a series resonant circuit, consisting of a winding L_1 and two capacitors C_2 and C_3 connected in series, are typically found at the "out" output point from the main connecting apparatus EVG_1. A fluorescent light FL is connected with one terminal for each of two electrodes with incadescent coils W_1 and W_2 in the output circuit of the main connecting apparatus EVG_1. The other two connections of incadescent coils W_1 and W_2 are connected with one another over two capacitors C_2 and C_3 as well as a temperature- dependent resistance PTC.

With connection of the main connecting apparatus EVG_1 the resistance PTC_1 is generally cold and therefore of low ohmic resistance. Capacitor C_2 is therefore practically short-circuited. In this switching state, in order to prevent the voltage between

incadescent coils W_1 and W_2 from becoming sufficiently high to allow luminous current discharge to occur in fluorescent light FL, capacitor C_3 must incorporate a corresponding capacity, typically 6 nF. A current of typically 100 mA is flowing through the output circuit of electronic main connecting apparatus EVG_1 when in this switching state, which heats the two incadescent coils W_1 and W_2 as well as the resistance PTC_1 to approximately 900° C in a very short time, typically less than 1 second. As a result of this heating the resistance PTC_1 is highly resistant, which leads to the rise of the voltage between incadescent coils W_1 and W_2 to approximately 1000 V, so that fluorescent light FL is lighted without luminous current discharge. As soon as this has happened and consequently current can flow through the inert gas found in fluorescent light FL between incadescent coils W_1 and W_2, the voltage between incadescent coils W_1 and W_2 collapes to a constant glow of typically approximately 100 V. The two capacitors C (TN : sic) and C_3 as well as the resistance PTC_1 are thus indeed not separated from the output circuit of the main connecting apparatus EVG_1, or respectively from the incadescent coil circuit, so that the resistance PTC_1 thereafter consumes current in the range of approximately 0.5 W, which heats it and keeps it highly resistant. This leads to the other aforementioned drawbacks of this known circuit.

In order to avoid further unnecessary consumption of current following the ignition of fluorescent light FL in the output circuit of an electronic main connecting apparatus EVG_{11}, it is suggested according to the invention to configure the output circuit of the

main connecting apparatus EVG_{11} as in Fig. 2. Thus it is required that the main connecting apparatus EVG_{11}, as opposed to the known electronic main connecting apparatus of Fig. 1, in addition to the 300 V / 40 kHz "out" output or discharge, also have a 300 V high voltage output "+". Following series-connection of the main connecting apparatus EVG_{11}, fluorescent light FL in turn is placed under voltage through the multiple resonant circuit and is supplied with current. As the result of the lack of an incadescent coil-igniting current, which in the case of ignited fluorescent lamp FL flows in the inert gas of the lamp between incadescent coils W_1 and W_2, the voltage rises between incadescent coils W_1 and W_2 because of the fact that the cold thermoresistance PTC_{22} at this time point has low ohmic resistance, on the voltage present at the high voltage "+" output of the main connecting apparatus EVG_{11} and current flows simultaneously reciprocally over the two diodes D_1 and D_2 through the resistance PTC_{22} and during the entire duration of incadescent burning of the fluorescent light through a potential-balancing capacitor C_{32}. Therefore, thermoresistance PTC_{22}, exactly the same as incadescent coils W_1 and W_2 in fluorescent light FL, is heated and becomes increasingly resistant. As soon as thermoresistance PTC_{22} has become sufficiently heated, which with suitable selection of the circuit components is the case in less than one second, this resistance becomes resistant, which leads to the situation in which the voltage between the two incadescent coils W_1 and W_2 can rise above the high voltage "+" output of main connecting apparatus EVG_{11} as far as the ignition voltage of fluorescent lamp FL which is approximately 1000 V. At this moment

the voltage between incadescent coils W_1 and W_2 falls to the operational voltage of fluorescent light FL of typically 100 V, which leads to the situation in which no more current can flow through thermoresistance PTC_{22} and capacitor C_{32} from the "+" output of main connecting apparatus EVG_{11}. In the case of the fluorescent light FL to be ignited, then, this portion of the circuit is dead and thus consumes no more current.

It has been shown that for the circuit according to the invention, starting from an electronic main connecting apparatus EVG_{11} with the circuit components according to the output characteristics shown in Fig. 2, the following features are suitable in order to guarantee a clean and effective ignition of fluorescent light FL :

C_{11} = 68 nF

L_{11} = 3 mH

C_{22} = 3 nF

C_{32} = 47 nF

D_1 = 1N4007

D_2 = 1N4007

PTC_{22} = Siemens PTC C890 265V

The person skilled in the art recognizes that with a minimum structural cost as compared with conventional main connecting circuitry on the one hand any continuous and superfluous current use can be avoided in the circuit and on the other hand the preheating of incadescent coils W_1 and W_2 of fluorescent light FL occurs under a voltage which is maintained more or less constant. This delivers

not only the advantage of an overall lower use of current in a suitably fitted fluorescent light, but also additionally increases the number of possible on-and-off cycles of the light.

Of course the circuit according to the invention can be adapted to special requirements and conditions and lamp characteristics, and the components being used can be different from those used until this time. Under certain conditions, for the purpose of comparison of the currents flowing through incadescent coils W_1 and W_2, it is possible to connect a capacitor parallel through incadescent coil W_2, which typically can be 47 nF. Also the electronic main connecting apparatus EVG_{11} can be adapted corresponding to the power supply voltage and frequency as well as the voltage and current characteristics required for operation of the light associated with it, and this lies completely within the framework of what an average electronics expert can do without further inventive contribution.

PATENT CLAIMS

1. Electronic circuit for the preheating of the electrodes (W_1, W_2) of fluorescent lights (FL) for their ignition, which circuit is connected with the outputs ("+", "out" and "0") of an electronic main connecting apparatus (EVG_{11}) and the terminals of the electrodes (W_1, W_2) of the fluorescent light (FL) and to at least one series resonant circuit consisting of a winding (L_{11}) and a first capacitor (C_{22}) as well as a temperature-dependent resistance (PTC_{22}) and a second capacitor (C_{32}), characterized in that the resistance (PTC_{22}) together with the second capacitor (C_{32}) and a first diode (D_1) is connected parallel to the first capacitor (C_{22}) and is connected through a second diode (D_2) with a high voltage output ("+") of the main connecting apparatus (EVG_{11}).

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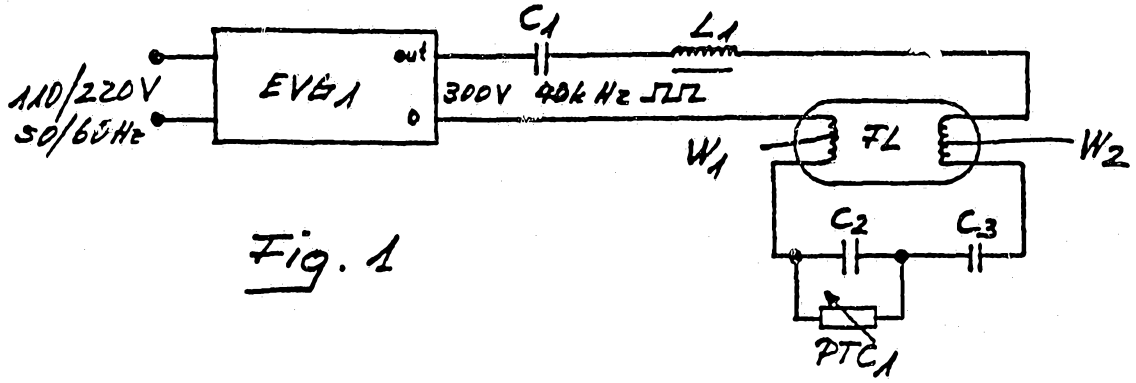

Fig. 1

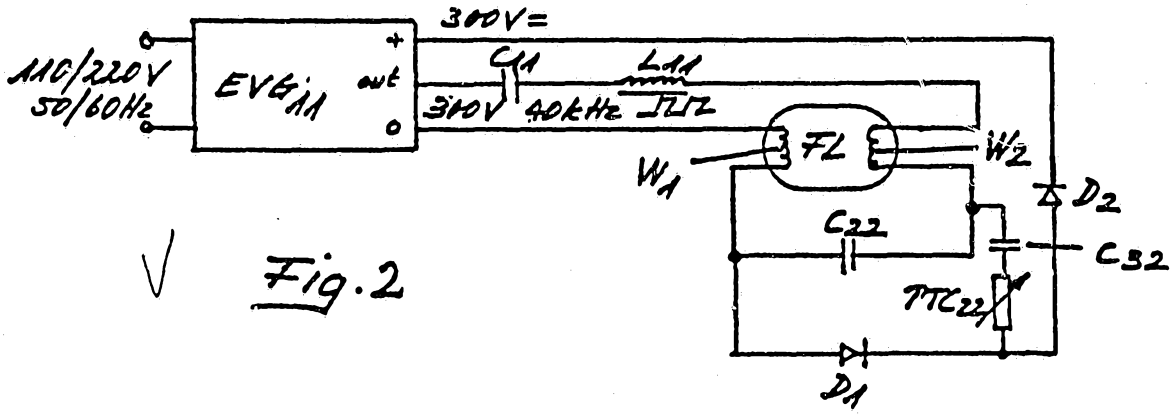

Fig. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/CH 90/00249

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.[5] H 05 B 41/29

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int.Cl.[5]	H 05 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	EP, A; 259646 (SIEMENS) 16 March 1988 see abstract see column 4, line 5 - column 6, line 56; figures 1-6	1
A,P	EP, A, 378992 (PATENT TREUHAND) 25 July 1990 see column 1, line 24 - column 2, line 15 see column 3, line 33 - column 4, line 6; figure 1	1
A	EP, A, 185179 (PATENT TREUHAND) 25 June 1986 see page 5, line 21 - page 7, line 3; figures 1-4	1

* Special categories of cited documents: [14]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
24 January 1991 (24.01.91)	27 Februay 1991 (27.02.91)
International Searching Authority	**Signature of Authorized Officer**
European Patent Office	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

PCT/CH 90/00249
SA 41041

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information. 24/01/91

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US-A- 4730147	08-03-88
EP-A-378992	25-07-90	DE-A- 3901111	19-07-90
		JP-A- 2227998	11-09-90
EP-A-185179	25-06-86	DE-A- 3441992	22-05-86
		JP-A- 61126795	14-06-86
		US-A- 4647817	03-03-87