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54 Simplified power source for fluorescent lamps.

57 A simplified power source for fluorescent lamps is characterised in that the filaments (F1 to F4) of the fluorescent lamps are connected in series with the primary winding (N1) of a transformer, an oscillator circuit (Q) and the power source (3,4) so that the oscillating current will exert high voltage across the primary winding to start and drive the fluorescent lamps and when any fluorescent lamp is removed from its sockets, the oscillator circuit will be opened.

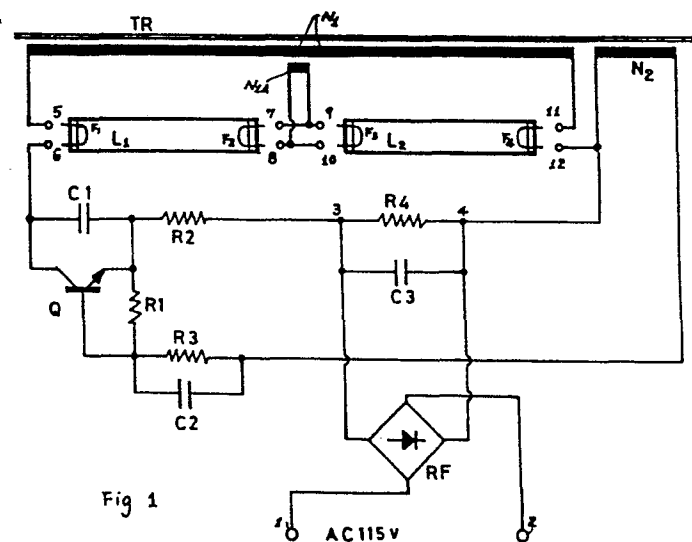


Fig 1

"SIMPLIFIED POWER SOURCE FOR FLUORESCENT LAMPS"

The present invention relates to a simplified power source for fluorescent lamps and the like.

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The usual fluorescent lamp circuit comprises a ballast circuit and a starter circuit to start and drive the fluorescent lamp for its illumination.

Mr John T. Pierce disclosed a "Power source for fluorescent lamps and the like" patented on June 10, 1975 (U.S. Patent No. 3,889,153) to have improved light output, lower power consumption and high reliability for fluorescent lamps. However, the lamps are independently operated from the oscillator circuit so that several capacitors are provided to couple the electric energy from the oscillating power source with the lamps. Hence, several defects are found as follows:

1. Several windings of the transformer must be provided to induct voltage to pre-heat the lamp filaments to cause dissipation of electric energy.
2. Whenever removing either lamp from the circuit, an open circuit will occur so that the voltage across the transformer primary winding will be increased during the transistor turn-off portion of the inverter cycle. The increased voltage may cause over-heating of the transistors or serious damage to the capacitors.

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Hence, a unique protective circuit must be further provided to increase the product cost.

3. As high voltage oscillation, the high tension will still exist on both sides of lamp sockets to cause danger when removing the lamp tube.
4. The oscillator circuit is independently separated with lamps so that it will consume energy in despite of the connection or disconnection of fluorescent lamps.

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The object of the present invention is to provide a power source wherein the filaments of fluorescent lamps are connected in series with the transformer winding so that the primary winding of the transformer will be connected to the power source and oscillator circuit by means of the filaments and wherein the transformer winding itself will serve as an element of the oscillator circuit so as to simplify the whole circuit for lower construction cost and lower power consumption as well as to enhance safety because the circuit will be opened to stop oscillation and to prevent from occurring of high voltage when any lamp is removed from the circuit.

25 The present invention can be clearly understood by the accompanying drawings, in which:

Figure 1 is a circuit diagram of power source for two fluorescent lamps in accordance with the present invention; and

30 Figure 2 is a circuit diagram of power source for a single fluorescent lamp of the present invention.

The attached drawings show the preferred embodiments of the present invention.

5 The power source circuit as shown in Figure 1 comprises a high frequency transformer TR which is composed of three windings, N1, N1A and N2.

10 Primary winding N1 of transformer TR is also an oscillating winding in that one end thereof is connected through contact 5, filament F1 of a fluorescent lamp L1 and contact 6 to the collector of transistor Q of an oscillator circuit and in that another end thereof is connected through contact 11, filament F4 of a fluorescent lamp L2 and contact 12 to the
15 positive electrode 4 of the power source.

Two ends of the winding N1A are respectively connected to filaments F2 and F3 which are connected in parallel through contacts 7, 8, 9 and 10 in order to
20 facilitate the heating of said two filaments F2 and F3.

Feed-back winding N2 is connected at one end to the positive electrode 4 of power source and connected at another end to the base of transistor Q through
25 resistor R3 and capacitor C2 which are connected in parallel.

Associated with the transistor Q are resistor R1, which is connected between the base and the emitter, and
30 a capacitor C1 which is connected between the collector and the emitter of the transistor Q. The emitter is connected to negative electrode 3 through a resistor R2.

The terminals 1, 2 are fed with alternating current at, for example, 115 volts. The input current is rectified by rectifier RF and then smoothed by capacitor C3 to provide direct voltage across a resistor R4 which has terminals 3, 4.

When the circuit is supplied with power, the base of said transistor Q will receive a positive bias to increase the current between the collector and the emitter thereof. The current passing through the filaments to primary winding N1 of transformer TR will be increased. However, the polarity of said feed-back winding N2 is such that the winding provides negative feed-back so as to choke the increasing current. The transistor constitutes a transformer-coupled blocking oscillator, which oscillates at a frequency which is more than 20 KHZ. A high voltage is rapidly developed across the winding N1; the filaments of L1 and L2 will accept the current supplied from N1 to heat the lamp tubes for rapid starting. The voltage across the winding N1 will instantly light up the lamps.

When removing either lamp from such a circuit, the oscillatory loop which includes the winding N1 will be opened and the high voltage across the winding N1 will be eliminated.

In the modification shown in Figure 2 a single lamp 6 takes the place of the two lamps shown in Figure 1; the filament winding N1A and filaments F2, F3 will then be omitted.

The present invention has the following advantages over the circuit shown in Pierce's patent:

1. The filaments of the lamp or lamps constitute a current path which can be directly pre-heated so that the complex pre-heating winding and starting circuit of Pierce's patent can thus be simplified.
2. The filaments also constitute a current path of said oscillator circuit so that the circuit will be opened when any lamp is removed therefrom; thus open circuit protection is provided.
3. The filaments are connected in series with said primary winding N1 so as to avoid any coupling means or components between the transformer winding and the lamps.

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Therefore, the present invention has advantages of simpler construction, lower production cost, less maintenance, lower power consumption and greater safety than the circuit shown in Pierce's patent.

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The lamps connected in the circuit may be further modified to three sets or more in accordance with the present invention.

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The present invention may be supplied with input voltage ranging from 6V to 300V by modifying the design data of the related components, such as: capacitance, resistance or number of windings.

CLAIM:

1. A simplified power source for fluorescent lamps comprising an oscillator circuit and a transformer, said
5 transformer comprising a primary winding and a feed-back winding, said oscillator circuit comprising a transistor and being characterized in that the collector of said transistor is connected to one end of said primary winding through a filament of the load lamp and in that the emitter
10 of said transistor is connected through a resistor, one pair of direct-current terminals, one end of said feed-back winding and another filament of the load lamp to another end of said primary winding and in that another end of said feed-back winding is connected to the base of said transistor
15 through a resistor and a capacitor both being connected in parallel.
2. A simplified power source according to Claim 1 wherein said primary winding of said transformer also serves as an
20 element of said oscillator circuit, and wherein both ends of said primary winding are connected in series with the filaments on both sides of load lamp so as to lead oscillating high voltage through filaments into lamp tube.
- 25 3. A simplified power source according to Claim 1 wherein said lamp filaments are connected in series with said oscillator circuit so as to lead oscillating current there-through for lighting a lamp.
- 30 4. A simplified power source according to Claim 1 wherein said filaments of load lamp are respectively connected to said primary winding, said oscillator circuit and direct-current power source so that said oscillator circuit will be opened as removing lamp from the circuit so as to prevent
35 from occurring high voltage or any possible danger.

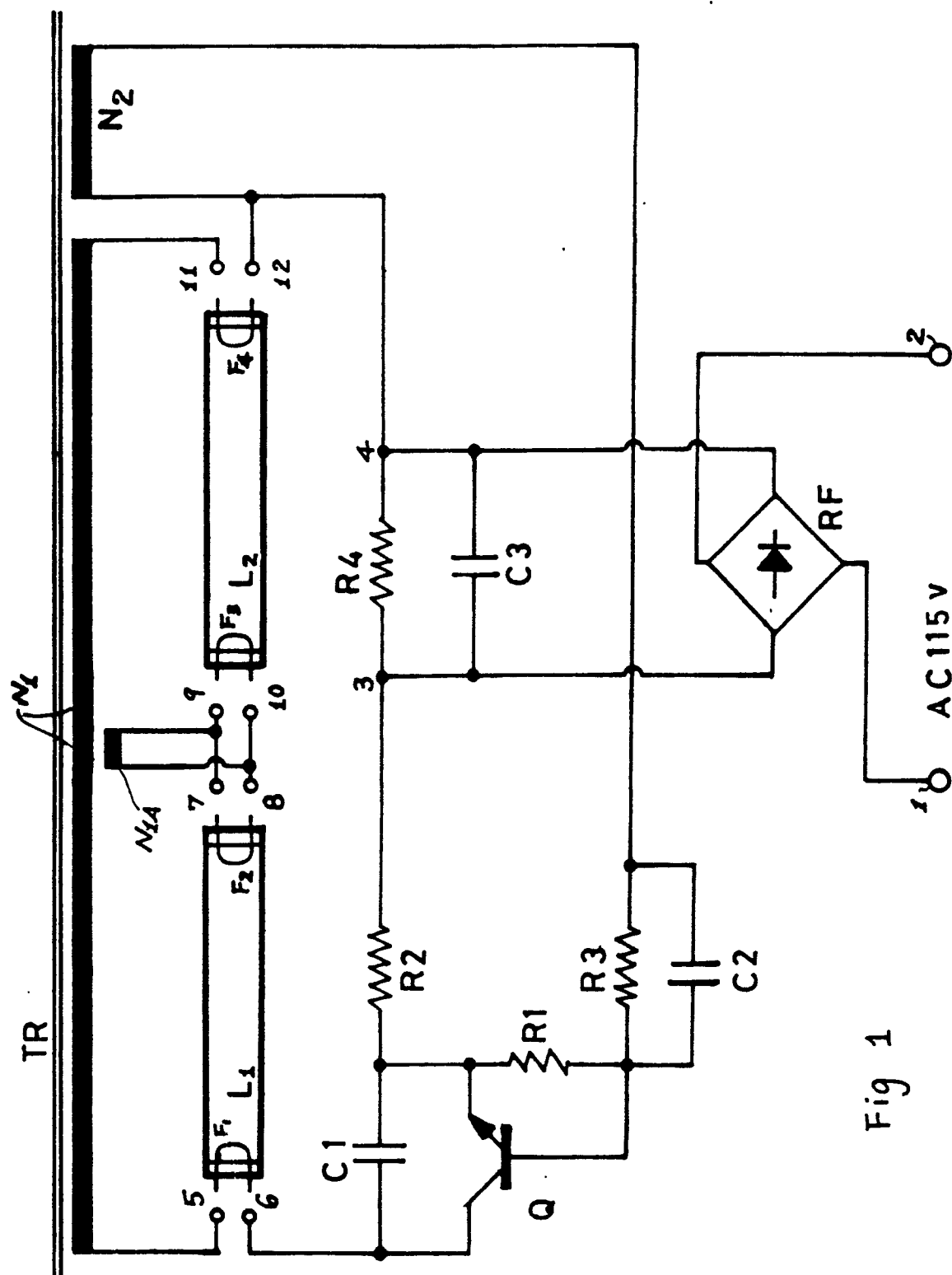


Fig 1



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EUROPEAN SEARCH REPORT

0056889

Application number
EP 81 30 0342

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 4 008 414</u> (AGNEW) * Column 2, line 45 - column 4, line 48; figures *	1-4	H 05 B 41/29
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	<u>US - A - 4 071 807</u> (ICHINOSE) * Abstract; figure 3 *	1	
	--		
	<u>US - A - 3 882 354</u> (MAY) * Abstract; figures *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 05 B 41/29
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 01-10-1981	Examiner DUCHEYNE