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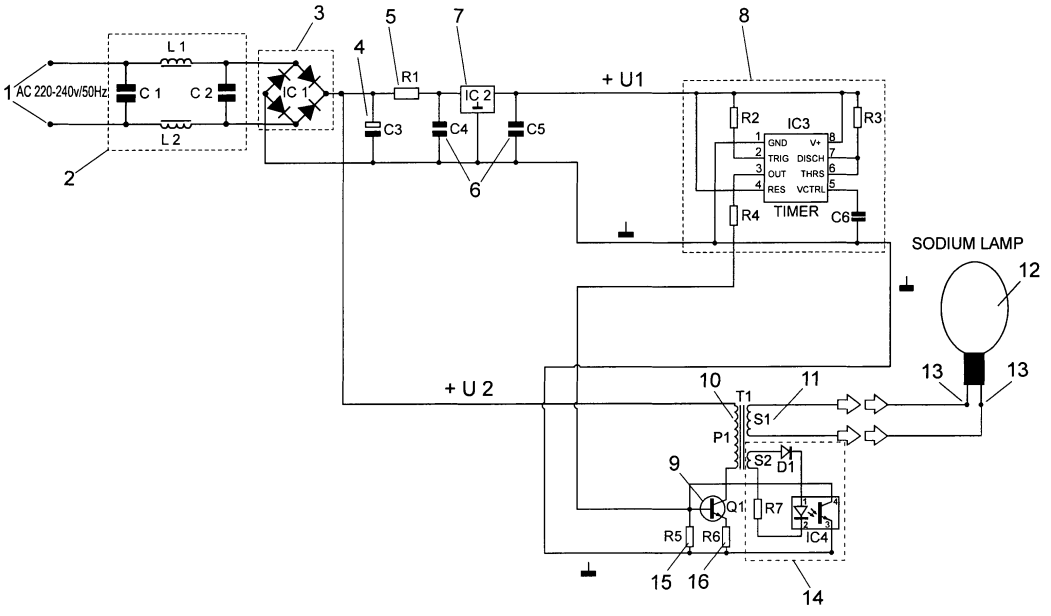
(54) Electronic circuit for energy saving and operation of sodium and mercury lamps

(57) Electronic circuit of initiation and operation of sodium and mercury lamps with energy saving that consists of an electronic filter (2) that includes combination of capacitors C1, C2 and inductors L1, L2, a "bridge" IC1 (3) of transformation of current from alternate to continuous, a capacitor C3 (4) for the stabilisation of oscillation that produces the "bridge" and a resistance R1 (5) via which the required drop of voltage becomes in order that with the suitable filters, the capacitors C4, C5 (6) becomes constant from stabilizer IC2 (7).

The constant current that has resulted from the stabilizer (7) passes through the oscillator (8) that is a high frequency generator and contains resistance R4 for the regulation of the voltage that enters in the transistor (9) and the capacitor C6 for the regulation of transistor operation frequency (9). The transistor input voltage is regulated by resistance R5 (15) while the corresponding output voltage is regulated by resistance R6 (16).

The transformed current at normal operation of the lamp is led to the electronic transformer T1, which has three threads, one superior P1 and two secondary S1 and S2. Threads P1 and S1 constitute parts of the superior (10) and the secondary (11) circuit respectively. The superior circuit (10) raise inductively the secondary (11) under normal lamp operation (12). The thread S2 is part of the control circuit (14) that controls the operation of the main circuit (10).



PICTURE 2

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Description

[0001] The invention belongs to the electrical technology and electronics sector and refers to an electronic circuit, which is used for the initiation and operation of sodium and mercury lamps with simultaneous saving of energy.

[0002] The use of electronic circuits with simultaneous saving of energy, for the initiation and operation of sodium and mercury lamps , is not widespread and is only used for the direct lighting of lamps (without the characteristic delay in the initiation with "yellow" light) and for the stability in the lighting.

[0003] Usual practice for the initiation and operation of sodium and mercury lamp is the use of ballast, starter. The two above elements are parts of the electrical circuit that is connected with the electrification network in which the ballast is connected in line to the lamp while the starter is connected in parallel. In this case the lamp brings glow threads.

[0004] As it is known, the light in the lamps of sodium and mercury is created with the shine of mercury steams , via the friction at the walls of the low pressure glass pipe, above in which there is fluorescent dust.

[0005] This typical technique of initiation and operation of sodium and mercury lamps that is used, consequences increased consumption of electric energy up to 20% roughly, due to the ballast heating and loss of energy that it is also due to the small degree of energy exploitation.

[0006] As it is known, the energy that consumes a lamp is calculated by the formula W=V*A * cosf (That is Energy = Tendency X Intensity X cosf). Cosf takes values from 0,33 - 0,51, depended to the ballast producer and the power of lamp. The mentioned before ballast also causes the appearance of electromagnetic parasitises and has great volume and weight as well as produces characteristic noise during operation.

[0007] The use of starter device is essential and is observed troublesome operation of starter and appearance of frequent breakdowns. The electric conductors (cables) quantity that it is used increases, due to the necessity of connection of ballast, the starter and the switch with the lamp.

[0008] The present invention intents to replace the electrical circuit of initiation and operation of sodium and mercury lamps with an electronic device that will eliminate the use of the ballast and the starter as well as the glow threads in the lamps. In other words it intends to the manufacture and use of an electronic circuit that will do the initiation and operation of the lamp much more efficient and constant, less complicated and absolutely noiseless. The sodium and mercury lamps are also exempted from the glow threads, a fact that will cause reduction of the cost of the lamps during their production.

[0009] According to the present invention the electronic circuit of initiation and operation of sodium and mercury lamps uses electric energy from the electrification network 220V/50Hz and it contains electronic absorption parasitises and vibrations filter that emanate from the high frequency generator, that prevents at the same time the transmission of these to the electrification network. The high frequency generator dispatches to the entry of the driver transistor the basic frequency, according to the power of lamp 70 up to 400W. The driver transistor that receives the basic frequency, supplies the electronic transformer with high frequency ferrite with more or less current and with this way the lamp is provided with the most excellent conditions of operation that increase the performance of electric energy. The basic generator frequency is 27KHz because with this value excellent conditions are achieved that are required for the constant and long-lasting operation of sodium and mercury lamps. The high frequency generator is connected in parallel is part of the electronic alternate current AC/DC transformer, which changes the alternate current to continuous and has filter for continuous current. The high frequency ferrite transformer has three threads. From these threads the one is the superior and two are secondary and all are galvanized and insulated between them. The secondary threads are: one small and one big. The superior, due to great frequency raise the big one which turns on the lamp. The small secondary is part of a control operation circuit of the lamp which is in charge for the interruption of current supply to the big secondary in case something happens away from the normal operation (short-circuit, fracture of lamp, current leak etc).

[0010] An electronic circuit of initiation and operation of sodium and mercury lamps according to the present invention presents a lot of advantages.

[0011] Basic advantage of the use of the electronic circuit is the economy at the consumption of electric energy and at the replacement of lamps, at the use of electrical - electronic elements and at the lamp manufacture.

[0012] Additionally, advantages such as the noiseless and constant operation and the exclusion of leathal electrocution, result from the use of electronic circuit for the initiation and operation of sodium and mercury lamps.

[0013] The consumption of electric energy is decreased up to 75% without the simultaneous reduction of the performance of the lamp, because the suppression of the ballast and the great number of conductors (cables) eliminate the appearance of energy loss due to heating. With the use of the transistor the supply of the electronic ferrite high frequency transformer with current becomes ideal, so that excellent operation conditions are provided to the lamp that increase the performance of electric energy. The ideal supply is combination of frequency that is given by the generator and the power of the connected lamp.

[0014] The replacement of the sodium and mercury lamp becomes more seldom because the duration of life until its natural destruction is increased. The low operation temperature at the 40° C and automatic adaptation of operation frequency and therefore the current supply, in relation to the power of the lamp, encourages the increase of duration of the life of the lamp, providing at the

same time ideal operation in a big breadth of different power.

[0015] One electronic circuit only, with incomparable smaller dimensions and weight, replaces the usual electrical elements ballast, starter and its institution. The production cost and maintainance of the electric circuit is very small and the operation time because of the ideal conditions of operation is evened with his natural destruction. On the contrary, up to now there is often the need of change the starter fluorescence lamps.

[0016] The absence of ballast disappears unpleasant noises and exempts the circuit from dangerously electromagnetic parasitises.

[0017] The possible contact with the one or the other driver during operation does not resolve leathal electrocution while possible short-circuit does not cause damage neither to the circuit nor to the electrical installation. This is achieved by the existence of the control circuit which supervises the normal operation of the circuit.

[0018] The present invention can be comprehended completely from the following analytic description concerning the attached drawings, which are parts of the total electronic drawing of the electronic circuit, in which:

Picture 1 presents the electrical drawing with the form that the lamp functions.

Picture 2 presents the growth of the electronic drawing of the present invention where schematically appear all the individual elements that perform the transformation of common electric current of domestic network (220V/50Hz) to high frequency continuous frequent and finally turn on the lamp with absolute safety and economy.

[0019] Picture 1 shows the electrical drawing with the lamp (B), the electronic circuit (A) of initiation and operation of the sodium and mercury lamps with saving of energy and the source of electric current (C) that is not other than the electrification network.

[0020] Picture 2 shows the entry of tendency of the alternate current (1) from the supply network, then the current passes through the combination of ballasts C1, C2 and inductors L1, L2 which constitute a filter of parasitises (2). From there it passes through the "bridge" IC1 (3) where it is transformed from alternate to continuous. Then the ballast C3 (4) stabilises the oscillation that produces the "bridge" and with the resistance R1 (5) is performed the required drop of tendency in order that the one with the suitable filters (6) at ballasts C4 and C5 becomes constant from stabilizer IC2 (7). The constant current passes from the oscillator (8) which is high requency current generator, at class of 27kHz. The oscillator is a common of trade element like the transistor or the resistances. In the particular form, it includes resistance R4 for the regulation of the tendency that enters in the transistor and the capacitor C6 for the regulation of transistor operation frequency. The transformed from continuous current (at frequency and intensity) enters in the transistor (9) and at the normal operation of the lamp it is led to the electronic ferrite transformer T1 which has a superior circuit P1 (10) which when it is supplied with tendency, due to the high current frequency, raise inductively the secondary circuit S 1 and S2 (11) which gives tendency and turns on the sodium or mercury lamp (12). The tendency at utmost (13) of the lamp is given to a terminal by each side of the lamp without the need of glow at the resistances that has the lamp at utmost. The control of normal operation of the main circuit is performed from the control circuit (14) which has the small secondary inductor S2 of electronic ferrite transformer at one utmost. When the lamp functions regularly then this circuit is found pending out of tendency. In case something happens away from the normal operation (short-circuit, fracture of lamp, current leak etc) then the small secondary ballast S2 receives the tendency increase that exists and gives a command via the control circuit (14) to interrupt the current supply to the lamp and thus the operation of circuit is rendered absolutely safe for the user. Finally for the regulation of entry tendency in transistor resistance R5 (15) is used and for the regulation of transistor output tendency resistance R6 (16) is used.

Claims

1. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving which includes electronic ferrite transformer T1, with three threads, one superior P1 and two secondary S1 and S2, that supplies with tendency the utmost (13) of the lamp (12), tendency that is led to it via a transistor (9) which precede a oscillator (8) and a tendency stabilizer IC2 (7) connected with electronic parasitises filter (2) before the bridge IC1 (3) for the transformation of current from alternate to continuous and is **characterized** from the fact that has a superior circuit (10) which when it is supplied with tendency, due to the high current frequency, raise inductively the secondary circuit (11) which transmits tendency and turns on the lamp (12) and is also checked by the control circuit (14) that at its utmost has the secondary inductor S2 and has the faculty in regular operation to be pending out of tendency while in case of short-circuit to conceive the tendency increase and to interrupt the current supply to the lamp (12).

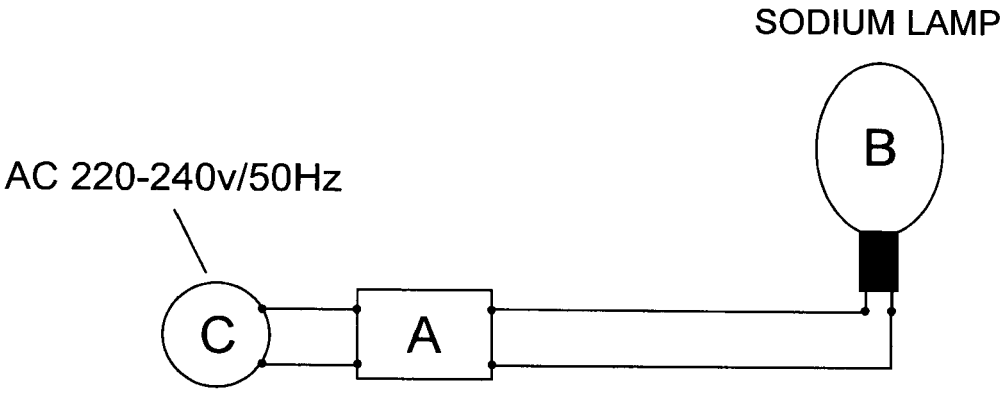
2. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving according to the claim 1, that is **characterized** from the fact that the electronic ferrite transformer T1 is supplied with less or more current via transistor (9) that receives the basic frequency from the oscillator (8) and in which the tendency of entry and expense can be altered via resistances R5 (15) and R6 (16) respectively.

3. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving according to the claim 2, that is **characterized** from the fact that the transistor (9) receives at its entry the basic frequency from the oscillator (8) as well as the tendency and the operation frequency at the transistor (9) can be regulated via resistance R4 and ballast C6 that intervene between transistor (9) and oscillator (8).

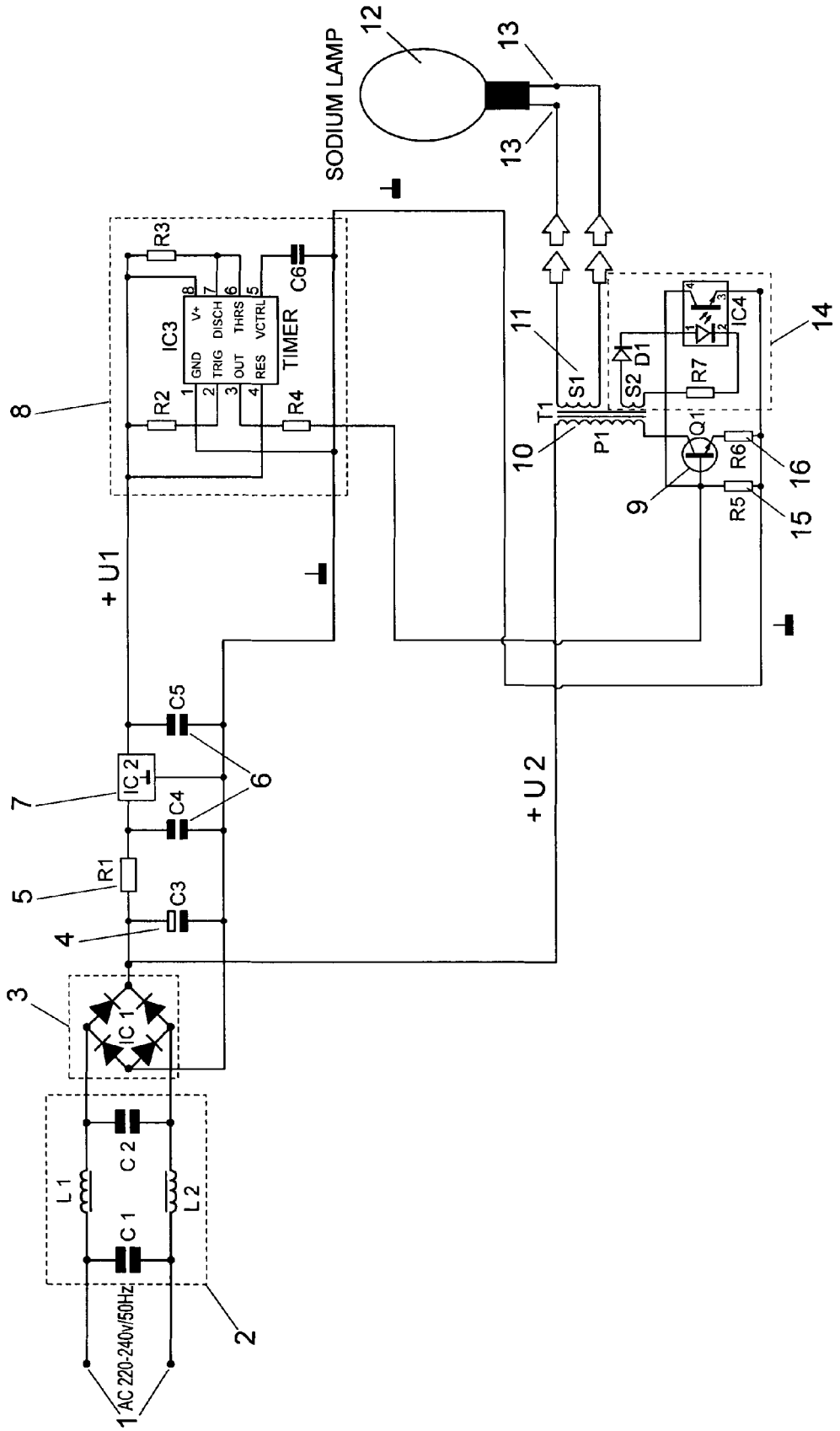
4. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving according to the claim 3, that is **characterized** from the fact that the oscillator (8), which is a high frequency generator has the faculty to alter the current frequency according to the power of the lamp 1 up to 65W, its basic however frequency is 27 KHz and it is connected with electronic filter of (2) combination of ballasts C1, C2 and inductors L1, L2 placed before the connection with the electrification network which absorbs the parasitises and the oscillations that result from its operation, preventing at the same time their entry to the electrification network. The transformation of the frequency becomes in constant, continuous current.

5. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving according to the claim 4, that is **characterized** from the fact that the continuous and constant current that is led to the oscillator (8) results via the "bridge" IC1 (3) and stabilizer IC2 (7) respectively, with the second one to own the filters (6) the capacitors C4 and C5.

6. Electronic circuit for initiation and operation of sodium and mercury lamps with energy saving according to the claim 5 that is **characterized** from the fact that the stabilisation of oscillation that produces the "bridge" IC1 (3) is performed before stabilizer IC2 (7) via ballast C3 as well as the drop of tendency which is required via resistance R1.



PICTURE 1


SODIUM LAMP
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9
16
15
R3
C6
IC3
GND
TRIG
OUT
RES
V+
DISCH
THRS
VCTRL
TIMER
R2
R4
8
+ U1
+ U 2
C5
C4
IC 2
7
6
R1
5
C3
4
3
IC 1
L 1
C 2
C 1
L2
2
1
AC 220-240v/50Hz

PICTURE 2

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EUROPEAN SEARCH REPORT

Application Number
EP 05 38 6018

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 33 03 374 A1 (RHEINTECHNIK WEILAND & KASPAR KG) 2 August 1984 (1984-08-02) * page 4, line 32 - page 5, line 4 * * page 5, line 17 - page 7, line 2 * * page 8, line 33 - page 9, line 6 * * figure 1 *	1-6	H05B41/285
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 March 2006	Silva, João Carlos

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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31-03-2006

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