(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 196 012 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.04.2002 Bulletin 2002/15

(51) Int Cl.[7]: **H05B 41/04**

(21) Application number: **01123778.1**

(22) Date of filing: **04.10.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **05.10.2000 IL 13889600**

(71) Applicant: **Eltam Ein Hashofet**
Israel (IL)

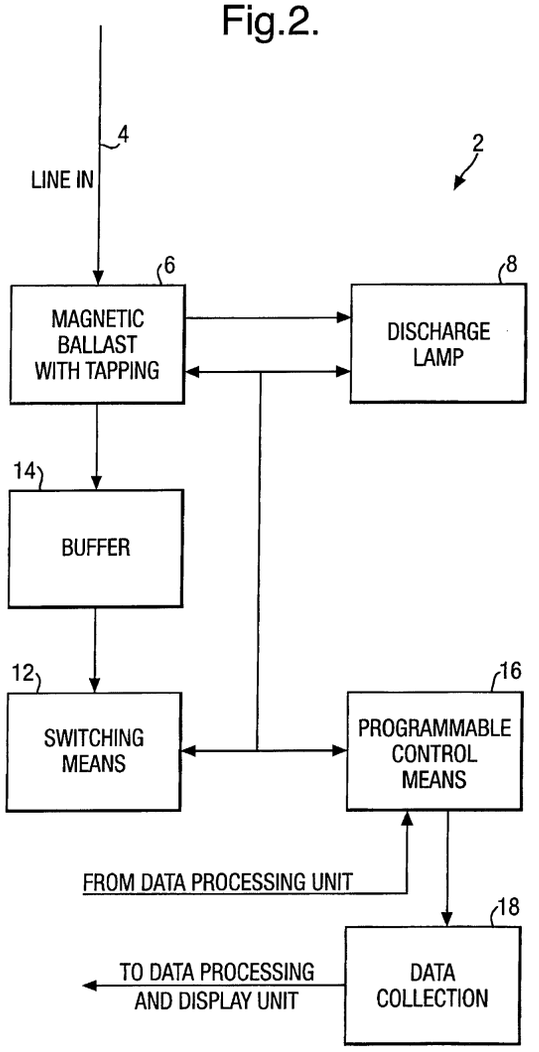
(72) Inventor: **Erez, Eran**
Israel (IL)

(74) Representative: **Betten & Resch**
Patentanwälte,
Theatinerstrasse 8
80333 München (DE)

(54) Ignitor for discharge lamps

(57) The invention provides an ignitor circuit for a discharge lamp, including a magnetic ballast having a coil equipped with at least one tapping enabling the ballast to be utilized as a pulse transformer; electronic switching means electrically connected to the ballast, and a programmable electronic control unit connected to the switching means and discharge lamp, for activating the electronic switching means in accordance with a specific discharge lamp's specifications and the position of the tapping along the coil of the ballast.

Fig.2.



EP 1 196 012 A2

Description

Field of the Invention

[0001] The present invention relates to ignitors, more particularly, to an ignitor circuit for a discharge lamp operating with magnetic ballast equipped with at least one tapping.

Background of the Invention

[0002] The current lighting technology relating to lamps operating with magnetic ballasts utilizes ignitors and ignitor circuits, as follows:

[0003] Ignition is performed by means of a pulser-type ignitor circuit such as that shown in Fig. 1, which includes a magnetic ballast in series with a discharge lamp, the ballast being equipped with a special tapping connected to an electronic circuit comprising a switch, capacitor(s) and resistor(s). The high voltage ignition pulses are generated by joint operation of the electronic circuitry and the ballast. The advantage of this method is its simplicity and low cost. This type of ignitor is further subdivided into two sub-groups: the fast pulse rate type, which supplies one or more pulses per half cycle of the mains voltage, and the slow pulse rate type, which supplies one or a few pulses per second. The former type provides good ignition, but has the disadvantage of causing harm to the ballast's insulation. The latter type does not harm the ballast's insulation, and it can be designed to supply wide pulses enabling it to ignite the lamp from greater distances (30-50 meters). However, due to its slow pulse rate, it is not suitable for some kinds of lamps.

[0004] Another known method of igniting discharge lamps comprises the use of a superposed pulse ignitor. Compared to the above-described ignitors, the superposed pulse ignitor circuit includes a special pulse transformer enabling the generation of high voltage pulses independent of the ballast, thus protecting the ballast insulation from harm caused by the pulses. The disadvantages of such a circuit stem from its relatively high costs, high loss of wattage, and self-heating. Furthermore, the rating of the pulse transformer included in the circuit limits the wattage of the lamps which it can ignite.

[0005] Each of the above-described ignitor circuits can be improved by adding a timing unit thereto, which will limit the time during which the high voltage pulses are generated. Ignitor types including timing units are also available, but they still partly suffer from the disadvantages discussed above.

Summary of the Invention

[0006] It is therefore a broad object of the present invention to ameliorate the disadvantages of the prior art ignitor circuits which include magnetic ballasts, and to provide a programmable ignitor circuit for discharge lamps with which safe ignition and ballast protection are obtainable at low cost.

[0007] It is a further object of the present invention to provide an ignitor circuit which can monitor the lamp and other components of the circuit and reprogram itself accordingly, and can, as well, send the collected data to an external computer for further processing.

[0008] In general, the present invention combines the advantages of supplying the ignition pulses as required by the lamp, protecting the ballast insulation and other circuit components, and low cost. Furthermore, the invention provides the option of monitoring the lamp and other circuit components.

[0009] The invention therefore provides an ignitor circuit for a discharge lamp, comprising a magnetic ballast having a coil equipped with at least one tapping enabling said ballast to be utilized as a pulse transformer; electronic switching means electrically connected to said ballast, and a programmable electronic control unit connected to said switching means and discharge lamp for activating said electronic switching means in accordance with a specific discharge lamp's specifications and the position of the tapping along the coil of said ballast.

Brief Description of the Drawings

[0010] The invention will now be described in connection with certain preferred embodiments with reference to the following illustrative figures so that it may be more fully understood.

[0011] With specific reference now to the figures in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of the preferred embodiments of the present invention only, and are presented in the cause of providing what is believed to be the most useful and readily understood description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention, the description taken with the drawings making apparent to those skilled in the art how the several forms of the invention may be embodied in practice.

[0012] In the drawings:

Fig. 1 is a circuit diagram and characteristic curve relating to a prior art ignitor;

Fig. 2 is a block diagram of a preferred embodiment of a programmable ignitor according to the present invention;

Fig. 3 is a detailed circuit diagram of a preferred embodiment of a programmable ignitor according to the present invention, and

Fig. 4 is a detailed circuit diagram of a further embodiment of a programmable ignitor according to the present invention.

Detailed Description

[0013] In contradistinction to the above-described prior art ignitors, in Fig. 2 there is illustrated a block diagram of a preferred embodiment of a programmable ignitor 2. The electrical energy flows from the mains via line 4 through the magnetic ballast 6 into the discharge lamp 8. The ballast 6 is equipped with a tapping 10 (Fig. 3). The ballast is also connected to a switching means 12 via a buffer 14. The joint operation of the switching means 12 and the magnetic ballast 6 is utilized to generate the high voltage pulses required for the process of igniting the lamp. The programmable control means 16 has two main functions: (a) to operate switching means 12 according to a certain program, and (b) to monitor the circuit and use the collected data at 18 to adapt its own program, as well as to send said data to an external computer (not shown) for further processing and display.

[0014] Fig. 3 illustrates, in detail, a preferred embodiment of the programmable ignitor 2. High voltage pulses are generated at the output of ballast 6 by switching on the sum of the voltages of the mains and capacitor C2 across a shorter portion 6', e.g., a ratio of 1:11 of the ballast coil, for short periods of time. The switching is performed by a bilateral switching device, e.g., triac 20 at a predetermined range of electrical degrees. The combination of diode D2 with resistors R4 and R6 enables the controller U1 to identify the zero crossing of the mains voltage. The voltage divider R3, R5 enables U1 to measure and monitor the lamp's voltage. Zener diode D1, resistor R8 and capacitor C1 constitute the power supply of U1.

[0015] The embodiment of Fig. 3 features, *inter alia*, the following advantages:

a) Control of the duration of pulse generation, pulse height, shape and rate in accordance with the lamp's specifications and in accordance with compensation which can be achieved by changing the tapping position along a given ballast coil, or, alternatively, by adjusting the timing of the triggering of the switching device at a predetermined electrical degree with respect to a given tapping position along a given ballast coil;
b) Monitoring of the lamp's voltage, lamp cycling, and lamp DC operation;
c) Communication with a central control unit through the mains conductors and/or an antenna;
d) Storage of data relating to the lamp's age, replacement of lamps, ignitor's age and the number of ignitions;
e) Performing ignitions according to schedule;
f) Failure alarm;
g) Division of a single power line into a number of logical domains, and
h) Reprogramming of automatic pulse properties, according to the lamp's requirements.

[0016] Fig. 4 illustrates in detail a further preferred embodiment of a programmable ignitor according to the present invention, which is a modification of the ignitor described above with reference to Fig. 3. The embodiment of Fig. 4 differs from that of Fig. 3 mainly in the following details:

[0017] Diode D2 and its parallel resistor (R6 in Fig. 3) are eliminated. Supply to port 7 of U1 is effected through a resistor R9 of larger value, whereby the DC supply is charged during both halves of the mains cycle, at better stability and with less loss of wattage. The embodiment thus uses a smaller number of components, and the triac 20 can be triggered by a negative pulse. Thereby, this circuit can use triacs that do not operate at Quadrant IV, which are more reliable and cost less. In addition, an inductor 22 is connected in series with the triac 20 for lowering the triac's current rate of change (*di*/*dt*) in order to lengthen its lifetime. Other minor changes seen in the circuit are considered to be changes which will be obvious to one skilled in the art.

[0018] It will be evident to those skilled in the art that the invention is not limited to the details of the foregoing illustrated embodiments and that the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

Claims

1. An ignitor circuit for a discharge lamp, comprising:

a magnetic ballast having a coil equipped with at least one tapping enabling said ballast to be utilized as a pulse transformer;
electronic switching means electrically connected to said ballast, and
a programmable electronic control unit connected to said switching means and discharge lamp, for activating said electronic switching means in accordance with a specific discharge lamp's specifications and the position of the tapping along the coil of said ballast.

2. The ignitor circuit as claimed in claim 1, wherein said electronic switching means is a bilateral switching device.

3. The ignitor circuit as claimed in claim 1 or 2, wherein said programmable electronic control unit monitors at least one component of said ignitor circuit and/or the discharge lamp's operation.

4. The ignitor circuit as claimed in any one of claims 1, 2 or 3, wherein the ignition pulse height is adjusted to comply with the specifications of said lamp by triggering said switching means at a predetermined electrical degree of the mains voltage phase, thereby compensating for the position of the ballast tapping along the coil.

5. The ignitor circuit as claimed in any one of claims 1 to 4, wherein the height, duration and pulsing rate of the ignition pulses are limited to the essential minimum in order to avoid damage to the components of said circuit and to the insulation of said magnetic ballast.

Fig.1.
(Prior Art)

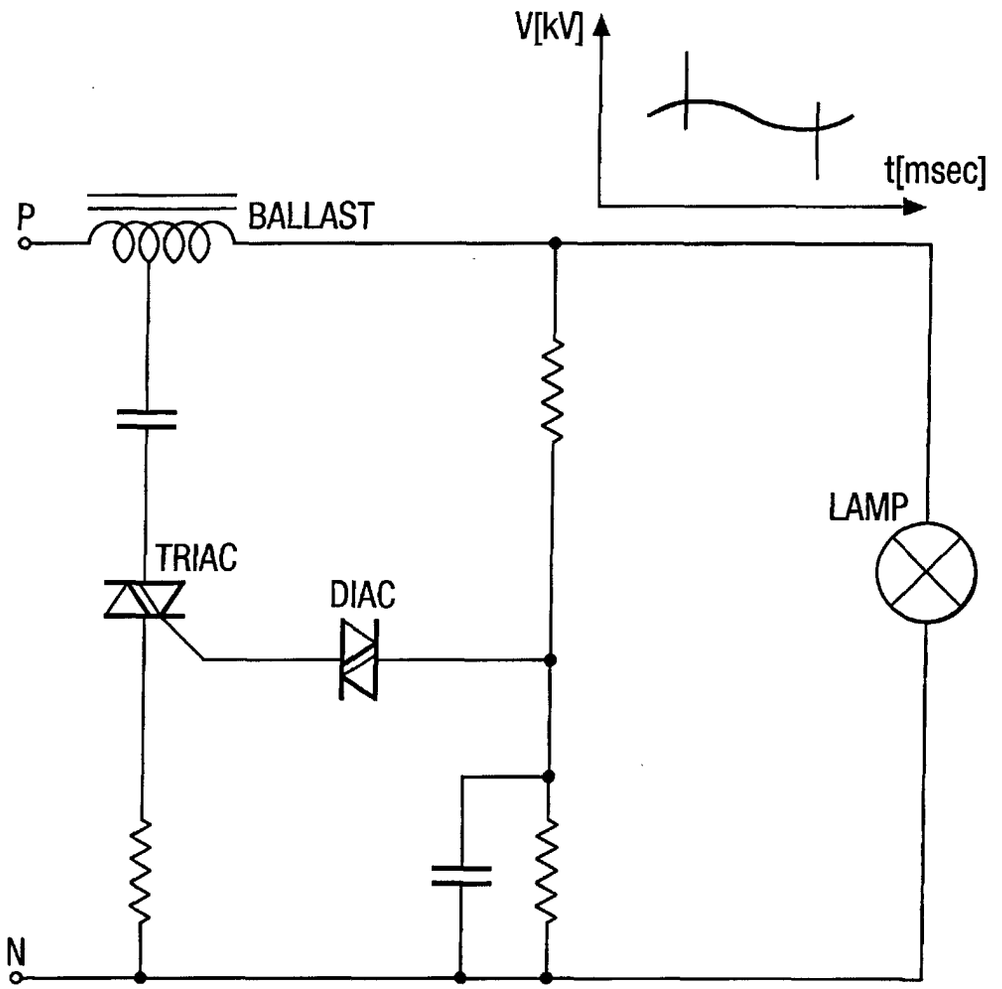


Fig.2.

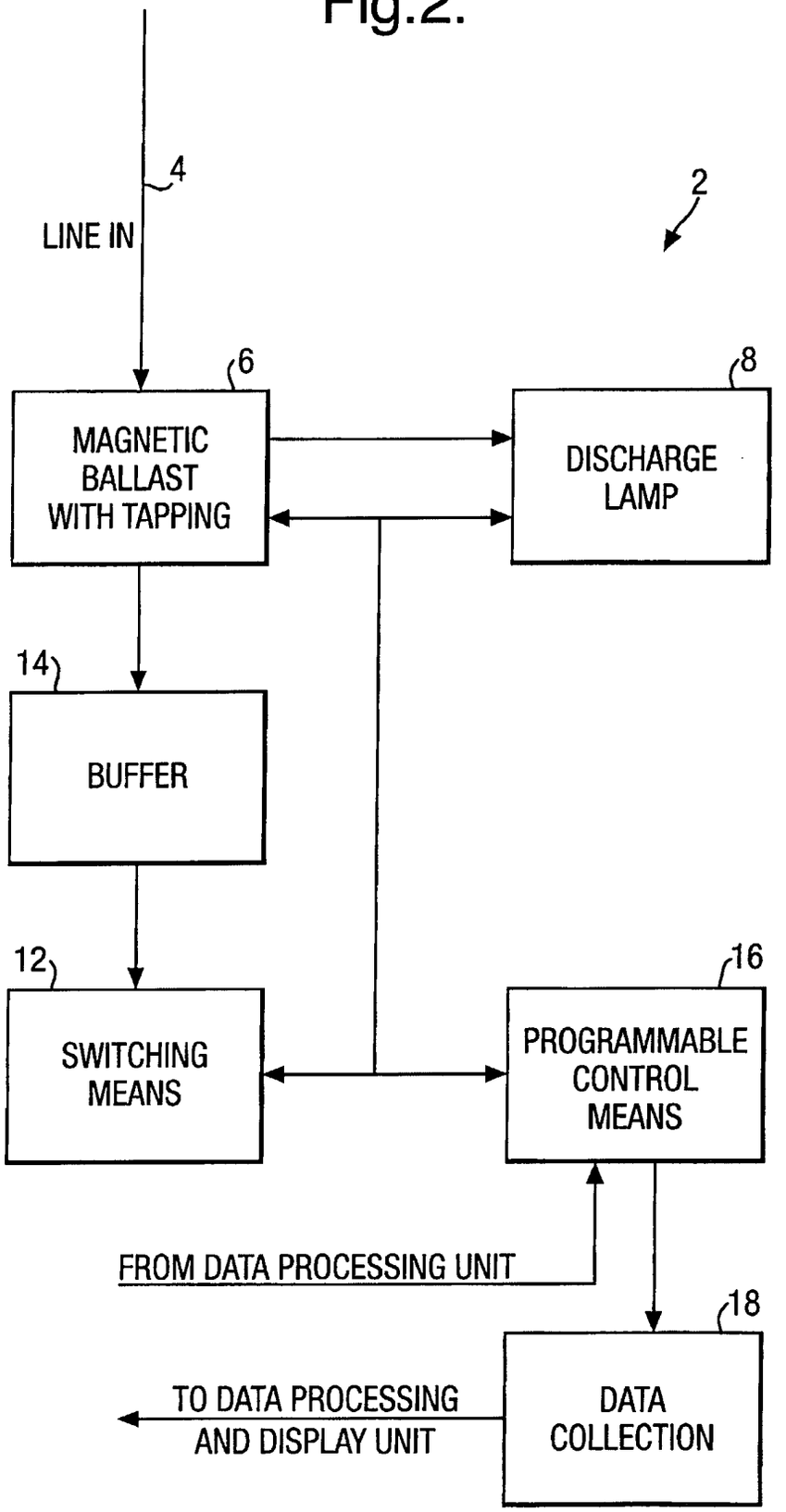

4
LINE IN
2
6
MAGNETIC BALLAST WITH TAPPING
8
DISCHARGE LAMP
14
BUFFER
12
SWITCHING MEANS
16
PROGRAMMABLE CONTROL MEANS
FROM DATA PROCESSING UNIT
18
TO DATA PROCESSING AND DISPLAY UNIT
DATA COLLECTION

Fig.3.

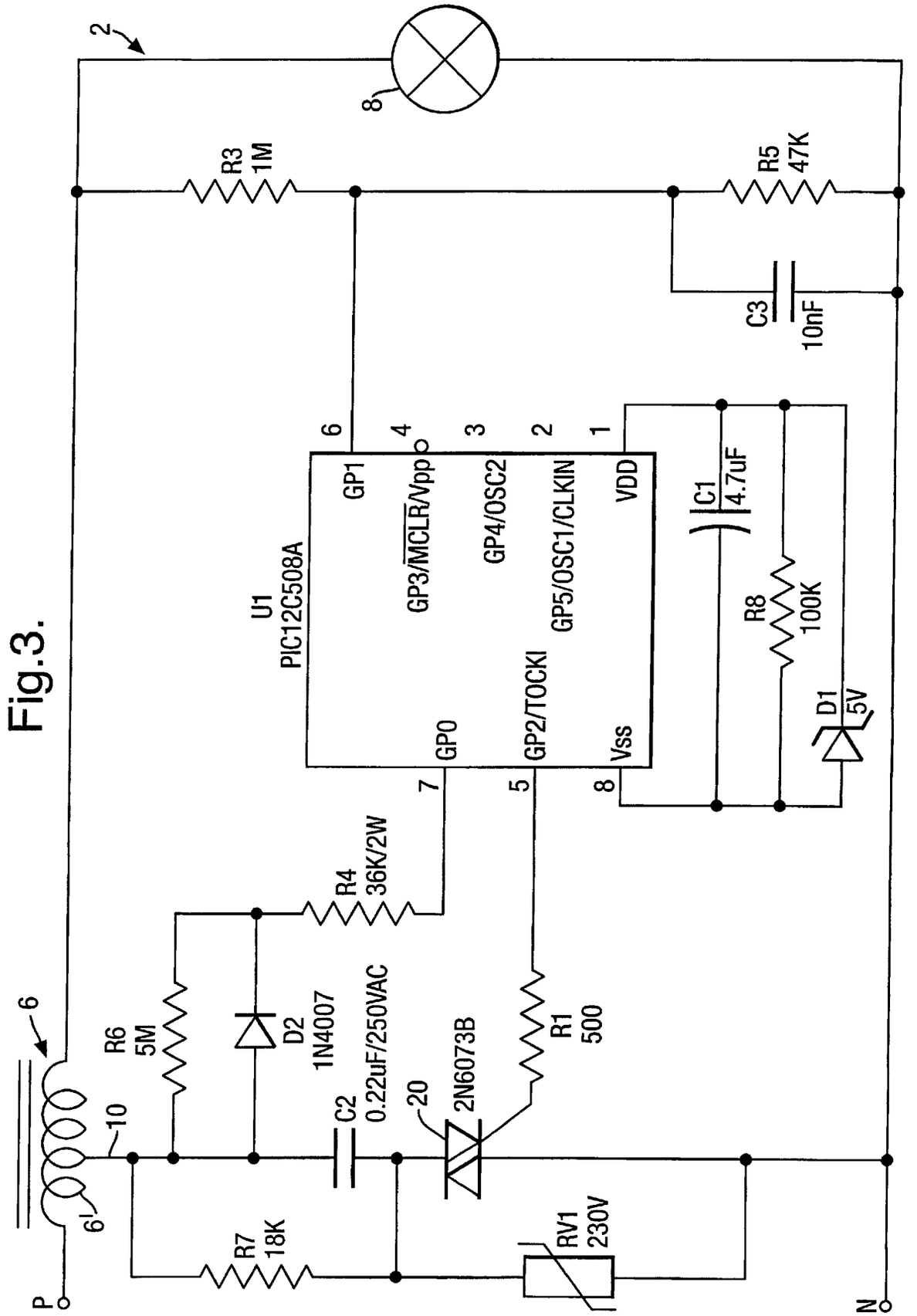
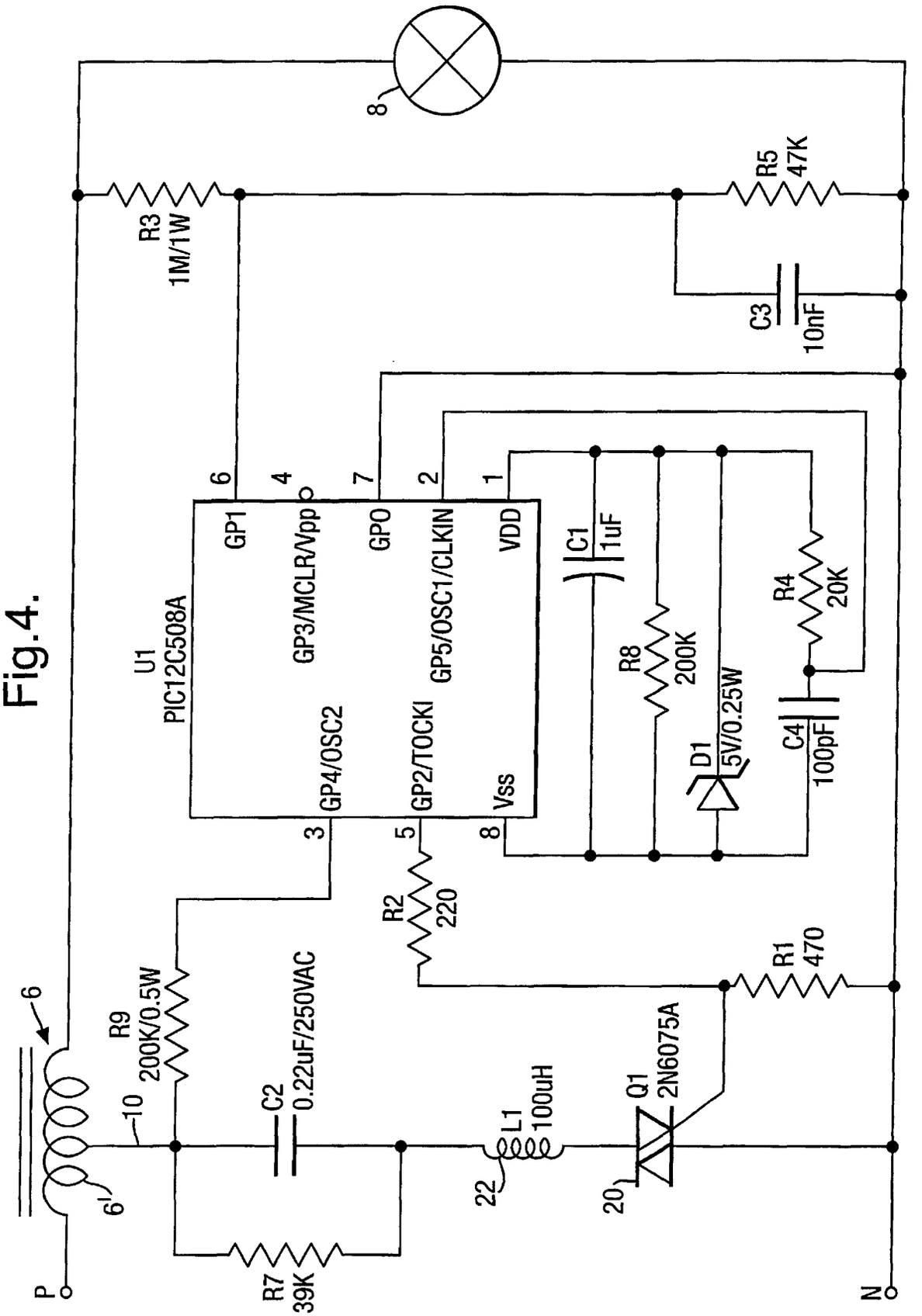

2
8
R3
1M
R5
47K
C3
10nF
U1
PIC12C508A
GP1
GP3/MCLR/Vpp
GP4/OSC2
GP5/OSC1/CLKIN
VDD
GP0
GP2/TOCKI
Vss
C1
4.7uF
R8
100K
D1
5V
R4
36K/2W
R6
5M
D2
1N4007
C2
0.22uF/250VAC
2N6073B
R1
500
R7
18K
RV1
230V
P
N
6
6'
10
20

Fig.4.


8
R3
1M/1W
R5
47K
C3
10nF
U1
PIC12C508A
GP1
GP3/MCLR/Vpp
GP0
GP5/OSC1/CLKIN
VDD
GP4/OSC2
GP2/TOCKI
Vss
6
4
7
2
1
3
5
8
C1
1uF
R8
200K
D1
5V/0.25W
R4
20K
C4
100pF
R2
220
R1
470
R9
200K/0.5W
C2
0.22uF/250VAC
L1
100uH
Q1
2N6075A
R7
39K
P
N
6
6'
10
22
20