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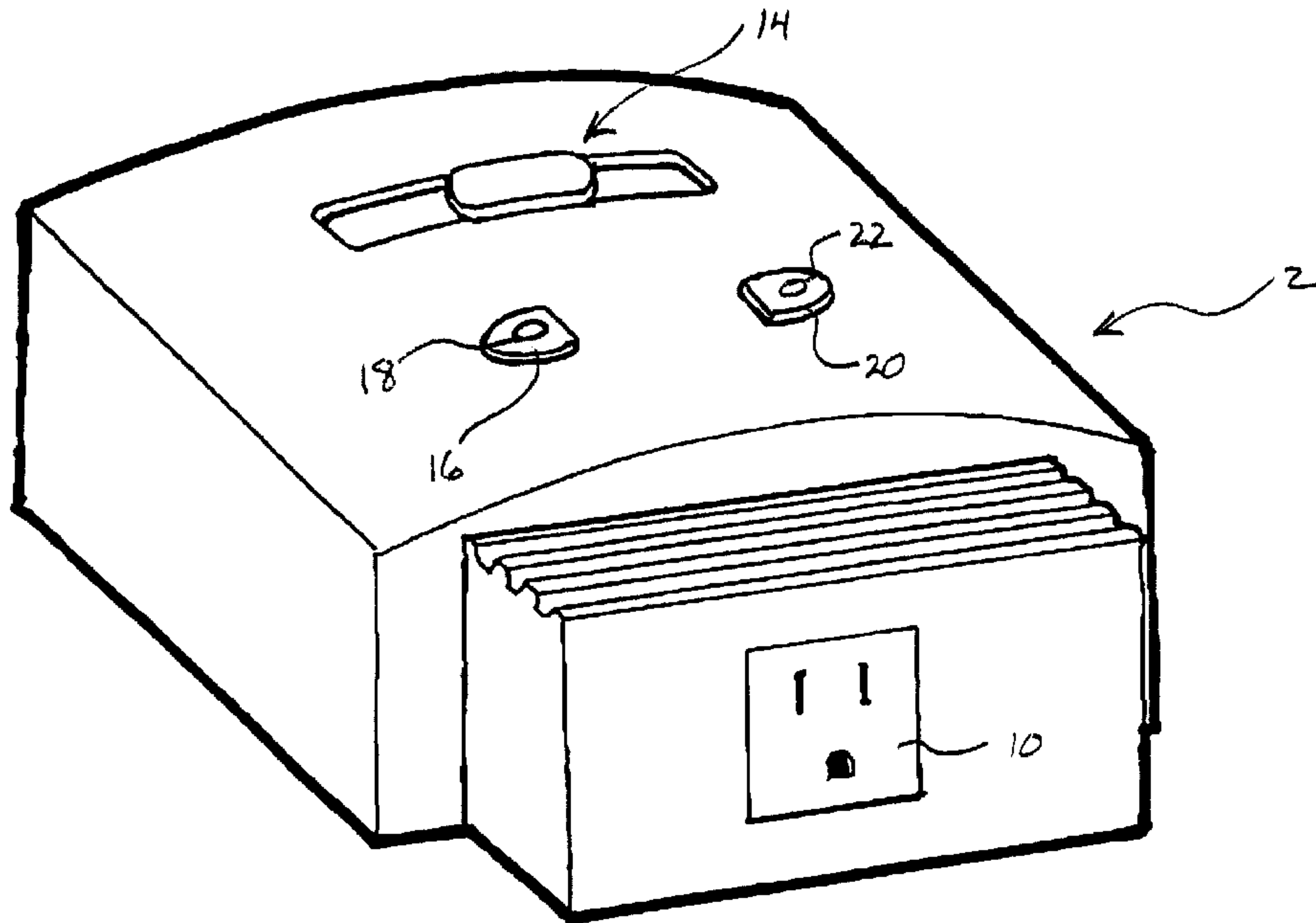
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(54) **DISPOSITIF DE COMMANDE ELECTRIQUE PROGRAMMABLE**

(54) **PROGRAMMABLE ELECTRICAL CONTROL DEVICE**



(57) A control device provides a convenient time out feature for appliances of different types. It is initiated by a manual action of the user to connect an appliance to power. This action resets the device for a predetermined period and provides power to the appliance via a timed receptacle. Expiry of the time interrupts the power until a reset signal is produced. The device is easy to use and appropriate for appliances of widely differing current draws.

ABSTRACT OF THE DISCLOSURE

A control device provides a convenient time out feature for appliances of different types. It is initiated by a manual action of the user to connect an appliance to power. This action resets the device for a predetermined period and provides power to the appliance via a timed receptacle. Expiry of the time interrupts the power until a reset signal is produced. The device is easy to use and appropriate for appliances of widely differing current draws.

TITLE: PROGRAMMABLE ELECTRICAL CONTROL DEVICEBACKGROUND OF THE INVENTION

5 The present invention relates to a resettable electrical control device which has particular application for controlling power to appliances including appliances have a substantial current draw.

10 Certain electrical appliances, if left on inadvertently, can pose a serious fire hazard. It is well known that a kettle, curling iron or an electric iron, if left unattended, are dangerous. Other electrical devices such as coffee makers and toasters have their own sensors
15 for automatic shut off, however, if the automatic shut off fails, these appliances can also place the user at risk.

 Each of these appliances are designed for a specific purpose and in general, some of these appliances include
20 sensors for interrupting the operation thereof whereas other similar devices on the marketplace do not have such safety features. Furthermore, old appliances which continue to function often were manufactured without such safety features.

25 Safety hazards as described above, can be a particular problem for senior citizens who have a tendency to forget or become distracted and can leave the appliances on unattended. This problem is compounded by the fact that
30 the appliances of this group tend to be older with less safety features.

SUMMARY OF THE INVENTION

35 An electrical control device according to the present invention provides power to an appliance for a predetermined period and upon expiry of the period automatically shuts off. The device requires some manual

manipulation to restore power to the device and once again,
resetting only provides power for a further predetermined
period. The control device has particular application as a
plug in device for a wall receptacle or as a smart
5 replacement for a wall receptacle.

The device automatically disconnects power to an
appliance rendering the appliance safe. In a further
aspect of the invention, the device is turned off by a
10 separate event such as arming of a securing system. This
automatically turns off appliances that were inadvertently
left on.

According to an aspect of the invention, the
15 electrical control device communicates over the household
wiring to a further device which provides instructions for
operation of the control device. This communication
preferably is X - 10 based, CEBUS or RF based.

20 An electrical control device, according to the
present invention temporarily connects an electrical
appliance to a power circuit for a predetermined duration.
The control device comprises an electrical receptacle for
receiving and forming an electrical circuit with an
25 electrical appliance. The electric circuit controls power
between the electrical receptacle and a power source
connection of a household, for example. The electric
circuit includes means for sensing a connection of the
electrical receptacle to an electrical device. A timing
30 arrangement automatically interrupts the supply of power to
the receptacle after a predetermined period.

According to a further aspect of the invention, the
electrical control device requires the user to change or
35 alter the condition of the control device to re-establish
power for a new time period.

According to yet a further aspect of the invention, the device includes a manual actuator for initiation of a new time duration for supplying power to the electrical appliance.

5

According to yet a further aspect of the invention, the electrical control device includes a manual adjustment mechanism for setting of a particular time duration.

10

According to yet a further aspect of the invention, the electrical control device includes LED indicators for providing a visual status report of the operational state of the device in either a power supply mode or a power interrupt mode.

15

According to yet a further aspect of the invention, the means for sensing a change in connection detects connection of an electrical device to the electrical receptacle.

20

According to yet a further aspect of the invention, the electrical device includes a transceiver for communicating over a power line using CEBUS.

25

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1A is a perspective view showing the electrical control device;

30

Figure 1B is a rear perspective view showing the electrical plug of the device;

Figure 1C is a schematic of the device, an electrical appliance and a wall outlet;

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Figure 2 is a logic flow chart of the operation of the electrical control device;

Figure 3 is a schematic of the circuit of the electrical control device;

Figure 4 is a schematic of the circuit used to sense the load;

Figure 5 is a schematic circuit of the preamp;

Figure 6 is a schematic of the power amplifier;

5 Figure 7 is a schematic of the timing arrangement;
and

Figure 8 is a block diagram of the electrical control device with audible alert.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The electrical control device 2 as shown in Figures 1A, 1B, and 1C, has a male plug 4 for insertion in a conventional wall receptacle indicated as 6 for powering
15 thereof. The control device 2 includes a timed receptacle 10, a time or duration slide set actuator 14, a re-activate switch 16, a power on LED 18, a power off switch 20, and a power off LED 20. Preferrably, these LED's are different colours to more clearly distinguish the operational state
20 of the device.

The electrical appliance 30, such as a kettle toaster, iron or lamp, has a male plug 32 of the conventional type which is received in the timed receptacle
25 10. An electrical circuit associated with the timed receptacle controls the device and either provides 120AC power to the receptacle 10 or disconnects 120AC power from the receptacle 10. The electric circuit is generally shown in Figure 3. When the control device is inserted into a
30 wall outlet, the device determines what time duration is set by the actuator 14. The timed duration preferrably allows settings of 10 minutes, 20 minutes or 30 minutes for example. Preferably, the maximum time duration is about one hour.

35

The act of inserting the control device into the wall outlet powers the device and the receptacle 10. The act of inserting the plug 32 of the appliance into

receptacle 10 automatically activates the timer. The sensing of the load enables the 60 Hz timing signal for the timer. Power is provided to the electrical receptacle 10 for the duration set by the actuator 14. Upon expiry of this period, the electrical receptacle 10 is automatically disconnected. Power can be resumed by the user manipulating the device to reset the time period, the receipt of a remote reset signal, by turning on the normal on/off power switch of the electrical appliance or by the removal of the electrical plug or the appliance. These actions automatically power the outlet 10.

In the logic diagram of Figure 2, it can be seen that the user can finish with the electrical device and manually remove the plug 32 from the receptacle 10. If this occurs, the circuit senses the removal of the plug 32 by detecting the absence of a load across receptacle 10. The sensed change of state returns the control device to its stand by state where the receptacle is reconnected to the 120AC power. In the alternative, the outlet 10 can continue to be powered until the time period has expired. It is also possible for the user to press the off button 22 which immediately interrupts the power to receptacle 10.

If the electrical appliance 30 remains connected to the control device 2 and the user does not actuate the off switch, the control device will be powered for the full duration set by actuator 14. Upon expiry of the period, the power to the electrical receptacle 10 is discontinued and the electrical appliance is automatically shut off.

The control device 2 has an on switch 16 and when actuated, resets the timer and provides power to receptacle 10. LED 18 indicates that the device is on and power is being provided to the receptacle 10. Power off switch 20 causes power to be disconnected to the receptacle 10 and also activates power off LED 22.

As indicated in Figure 3, the control device 2 could be in a non powered state and in electrical connection with a wall receptacle. For example, the device could have completed a conventional cycle. The power off LED is
5 activated. To activate the device, the user can press the on button 16, remove and reinsert the electrical plug 32 into the receptacle 10, turn the appliance off and then on, by its own switch, or the device can receive a remote turn on signal to return to a powered state. Any of these
10 actions will reset the timer and provide power to receptacle 10.

With this arrangement, the user must activate the device by plugging an appliance into it or activating a
15 switch to place the device in an "on" state given an appliance is connected to the receptacle 10. This starts a new timing cycle which will automatically turn the device off after a predetermined duration. The device also assumes a powered state if the electrical appliance is
20 removed.

As can be appreciated, this electrical control device, allows old appliances which do not have recent safety features, to at least have a time out function. If
25 the user happens to forget that the appliance is on, the appliance will be automatically shut off. This control device has particular application for many senior citizens where the appliances are often old and may not include safety features provided in equivalent new appliances.

30 The receptacle 10 of the device is normally powered if the appliance connected thereto has been operated in its intended manner. For example, the intended manner for an appliance with an on/off switch is to turn the appliance
35 off. This action, before or after the timing cycle is completed, provides power to receptacle 10. The appliance remains in a non activated state as the switch of the appliance is off. If the appliance does not have an on/off

switch, the normal operation would be to unplug it from the receptacle. This action returns power to receptacle 10 assuming the time feature had interrupted the power. The normal action to turn the appliance on, such as turning the
5 on switch, or plugging an appliance into receptacle 10, is maintained. The time period for providing power automatically functions and is essentially transparent to the user.

10 The device can also receive remote arming or disarming signals such as signals sent from a security system. In this case, arming of the security system produces a signal to interrupt power to receptacle 10, i.e., turn the device off. Disarming of the security system
15 allows the device to be i.e., powered in the normal manner or if a timeout has occurred.

These remote signals could be X-10 or CEBUS over the hardwiring of the household, or could be by radio frequency,
20 as used for wireless alarm systems. Communication over the household wiring is less expensive and transmission problems are avoided.

It is also possible to adjust the time out duration
25 by a remote signal.

The control device 2, as shown in Figure 1 is easy to use and provides significant safety improvements. The user merely has to insert an electrical appliance into the
30 receptacle 10 and the device is in a powered state. Similarly, if the appliance is already connected to the control device, power can be resumed by actuating the "on" button 16. Several of these devices can be provided at a different locations in the house and operate in the same
35 manner. Therefore, senior citizens who may wish this additional safety feature become familiar with the operation of the device and almost any action results in the device being reactivated. There is no requirement to

replace all appliances and the device also allows for convenient resetting if the time duration has not been sufficient. There is no appreciable learning curve as inserting of the plug of the appliance into the timed
5 outlet automatically activates the device or depressing the "on" switch activates the device. The device provides safety while allowing the device to operate in its intended manner.

10 The control device is not appliance specific and different time durations are easily set.

The control device, as will be further explained, relative to the circuit of Figure 3, accommodates effective
15 load sensing for both high current draw appliances such as kettles, and irons, and low current draw appliances such as lamps.

It is also possible to use the device as a
20 replacement wall mount receptacle. In this case, the face of the receptacle will have the LED status indicators and "on/off" switches. To provide convenience of use, a two outlet receptacle can be replaced with a single outlet receptacle with the additional controls provided near the
25 top thereof. A simplified version which includes the LED's and time duration set does not include the manual reset. The plug is reinstated to reset the device. If the appliance includes an on/off switch, turning the device off and on will reset the timer and resume power.

30 The circuit of Figure 3 shows the general components of the device. The male connector 4 has the hot line thereof connected to the hot terminal of the receptacle 10. A solenoid switch 42, when activated, connects the hot line
35 43 to the hot side 44 of the receptacle 10. The neutral line 45 of the receptacle 10 is connected to the neutral side 47 of the terminal 4. Thus the solenoid switch 42

connects or disconnects receptacle 10 from normal 120AC power.

5 A 24 volt supply source 50 provides power to the power supply 52 which powers the solenoid switch 42. The solenoid switch 42 is activated when the 24 volts is supplied thereto. This closes the switch and thus connects the hot line 43 to the hot side 44 of the receptacle 10 and thus the receptacle is powered. Supply of the 24 volts to 10 the relay 52 is selectively removed by the branch 54 of the circuit. This branch includes a power off signal 55 and a low voltage trigger signal 57 which is a time out signal as well as a no load signal. If either of these signals are provided to silicon controlled rectifier Q1, the arm 54 is 15 in a conducting state and the 24 volt is removed from the power supply. The transistor Q2 is normally in a conducting state, therefore the low voltage signal and the power "off" signal remove power from the solenoid switch. The signals to Q1 produce an "off" condition of the control 20 device and the relay 42 disconnects 120AC to the receptacle 10. Silicon controlled rectifier Q1 controls removal of the 24 volts from the solenoid switch 42 and Q2 acts as a reset switch.

25 The capacitor 62 is always connected to the AC feed 75, however, it is sized to only pass a small current. When an appliance is connected at receptacle 10 indicated as J1, a circuit is completed and the small current allows Load Sense 64 to recognize an appliance is connected. If 30 no device is present, there will be no connection across the receptacle 10 (J1) and the Load Sense 64 provides a low removes the supply pull low enable signal from 62.

35 Load Sense 64 also senses a change in load from open circuit, to a sensed load, i.e. removal of a plug at 10, followed by insertion. Load Sense 64 upon recognizing this condition interrupts power to Q2 causing 24 volts to return

to 42 and activating the relay. The low voltage trigger is removed from Q1 as part of the reset function.

As previously mentioned, once the device has timed
5 out or has been turned off, the user must do something
physically to turn the control device back on. The device
is reset by basically interrupting the arm 54 such that a
24 volt power supply is returned to the switch 42 and
closes thereof. This occurs given a load is absent. The
10 24 volts power the solenoid 42 and closes the switch.

The power to receptacle 10 can also be turned off by
actuating switch 66 which again causes the arm 54 to
conduct (Q2 normally conducting) and the 24 volts to be
15 removed from the switch 42. A manual reset switch is shown
in its normal conducting position. When the "on" switch 16
is pressed, it is moved to the alternate location and
breaks the feed through branch 54. This resets the circuit
returning power to the solenoid switch 42. Resetting
20 removes any signals from Q1, such that branch 54 is non
conducting.

The power only flows down through arm 54 when the
device has been switched off or the device has timed out.
25 In this way, the red light emitting diode 70 is turned on
when the arm 54 is activated. The various control signals
control the state of the silicon controlled rectifier (SCR)
72, and the transistor 74. For arm 54 to become active,
both the SCR 72 (Q1) and the transistor 74 (Q2) must be in
30 a conducting state.

The present control device includes a time duration
set period which is controlled by actuator 14. Thus the
duration that the device is active is determined by the
35 actuator. At the expiry of the time, a buzzer 120 (Figure
8) can be temporarily activated. This sound alerts the
user that power to the device has been interrupted.

The Load Sense 64 includes two schottky diodes 80 and 82 which provide a low resistance for sensing of the load. With this arrangement, the sensed voltage drop is low and the heat to be dissipated during operation of the appliance is low. This is important as the control device can be used with both high current draw appliances and relatively low current draw appliances. This diode schottky pair accommodates this range without the overall size of the control device appreciably increasing.

10

To accommodate sensing of the load, a processing arrangement is shown in Figure 4. Sensing of the load is based on a small current provided by capacitor C7 when an appliance is connected to the receptacle 10. The load signal sensed is amplified for evaluation.

15

The Load Sense 64 is shown in detail in Figure 4. A preamp 90 receives the input signal and amplifies the signal for the power amplifier 92. The output signal at 93 is appropriate for determination by Load detector 94, whether an appliance is connected to receptacle 10. An output signal 96 is sent to Q2 for resetting of the device. Q2 is switched off and the device is reset, including removing any signals from Q1.

20

Details of the preamp are shown in Figure 5, details of the power amplifier are shown in Figure 6, and details of a timing arrangement 98 are shown in Figure 7.

25

The present control device has particular application as a safety device and can be used without modification of existing appliances. The device in its simplest form includes an "on" switch which the user activates to start the conducting state and a time out feature which causes the device to interrupt power to the electrical device upon expiry of the time.

30

35

Figure 8 illustrates the CEBus Control 122 and its relationship with the power and AC control block 124, the Load Sense amplifier 126, the reset generator block 128, and the timing block.

5

In a more sophisticated form of the invention, the timed outlet is additionally controlled according to signals which are transmitted to the device and which can be set a remote location. According to another embodiment
10 of the invention, the signals may be provided to the outlet as radio signals or as infrared signals.

Although various preferred embodiments of the present invention have been described herein in detail, it
15 will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An electrical control device for automatically controlling the feed of power to an electrical appliance connected to said device, said control device comprising an electrical receptacle for receiving and forming an electrical circuit with an electrical appliance, an electric circuit connected as an intermediary between said electrical receptacle and a power source connection; said electric circuit including means for sensing an interruption in the feed of power to a change in connection of said electrical receptacle with an electrical device, and a timing arrangement for automatically stopping the supply of power to said outlet after a predetermined duration following sensed connection of an electrical appliance with an electrical appliance with electrical receptacle.
2. An electrical control device as claimed in claim 1 including a manual actuator for initiation of a new time duration for supplying power.
3. An electrical control device as claimed in claim 2 wherein said manual actuator additionally allows setting of different time durations.
4. An electrical control device as claimed in claim 1 including a sound generator which is temporarily activated upon expiry of said time duration.
5. An electrical control device as claimed in claim 2 wherein said means for sensing a change in connection detects connection of an electrical device to said electrical receptacle.

6. An electrical control device as claimed in claim 1 wherein said means for sensing a change in connection detects disconnection of an electrical device from said outlet and said circuit returns said receptacle to a powered state.
7. An electrical control device as claimed in claim 1 wherein said power source connection is a male electrical plug.
8. An electrical control device as claimed in claim 1 wherein said electrical control device is securable within an electrical box normally used to mount an electrical wall receptacle.
9. An electrical control device as claimed in claim 1 wherein said time duration is a settable time duration of less than 60 minutes.
10. An electrical control device as claimed in claim 9 wherein insertion of an electrical plug into said receptacle causes a current flow in said circuit which activates said timing arrangement.
11. An electrical control device as claimed in claim 10 wherein said time duration is provided to said device in a signal provided to said electrical power connection.
12. An electrical control device for managing the supply of current to an electrical appliance, said control device comprising an electrical receptacle for receiving and temporarily forming an electrical circuit with an electrical appliance by the insertion of a plug into said receptacle, an electric circuit connected as an intermediary between said electrical receptacle and a power source connection; said electric circuit including a sensing arrangement for sensing the initial supply of power to an appliance connected to said receptacle and sensing a

user action interrupting the supply of power to an electrical appliance connected to said receptacle, said electric circuit further including a timing arrangement that automatically stops the supply of power to said outlet after a predetermined duration following the powering of an electrical appliance connected to said electrical receptacle in the absence of said sensing arrangement failing to sense a user action interrupting the supply of power during said predetermined period.

13. An electrical control device as claimed in claim 12 wherein said sensing arrangement senses an interruption in power supplied to an appliance caused by an on/off switch being moved to an off position.

14. An electrical control device as claimed in claim 13 wherein said sensing arrangement senses the interruption of power caused by the removal of the appliance plug from said receptacle.

15. An electrical control device as claimed in claim 12 wherein said receptacle is powered when an appliance is initially connected thereto and when a connected appliance is turned off by means of an on/off switch of the appliance.

16. An electrical control device as claimed in claim 15 including a communication arrangement for receiving a remote control signal to interrupt the supply of power to the receptacle.

17. An electrical control device as claimed in claim 16 in combination with a security system, said security system when armed, transmitting a control signal received by said communication arrangement of said electrical control device and interrupts the supply of power to the receptacle.

18. An electrical control device as claimed in claim 12 wherein said device includes a male plug for connection with conventional 120AC power outlets and the receptacle of said device is automatically provided with power upon connection of said male plug with a 120AC power outlet.
19. An electrical control device as claimed in claim 12 wherein said receptacle is powered when 1) said device is connected by a user to a power supply, 2) said device is already connected to a power supply and an on/off switch of an appliance connected to said device is in an off state, 3) a user reset control of said device is activated, and 4) an appliance is disconnected from said receptacle.
20. An electrical control device as claimed in claim 19 including an on/off actuator for allowing a user to interrupt the supply of power to said receptacle.

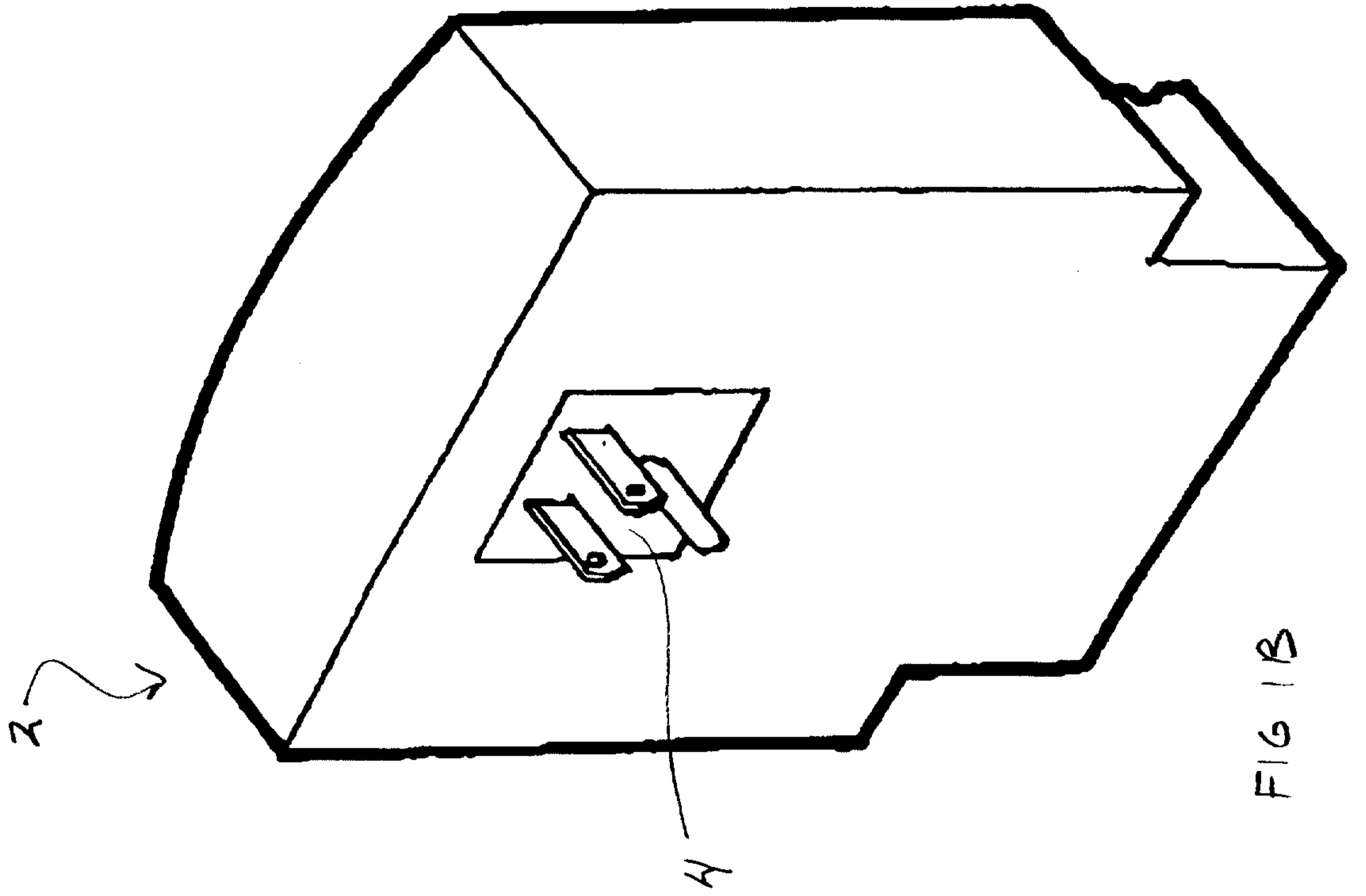
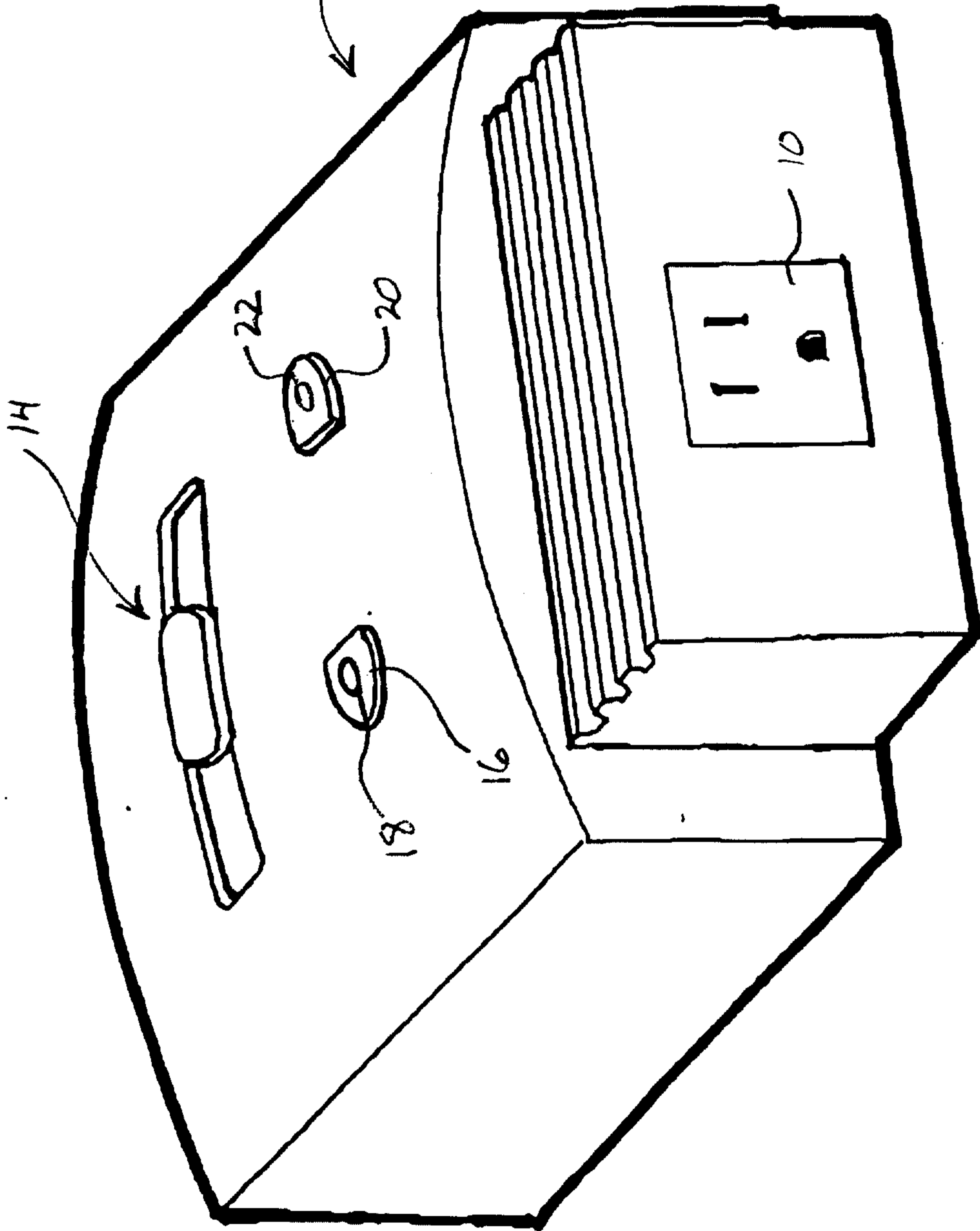


FIG 1B

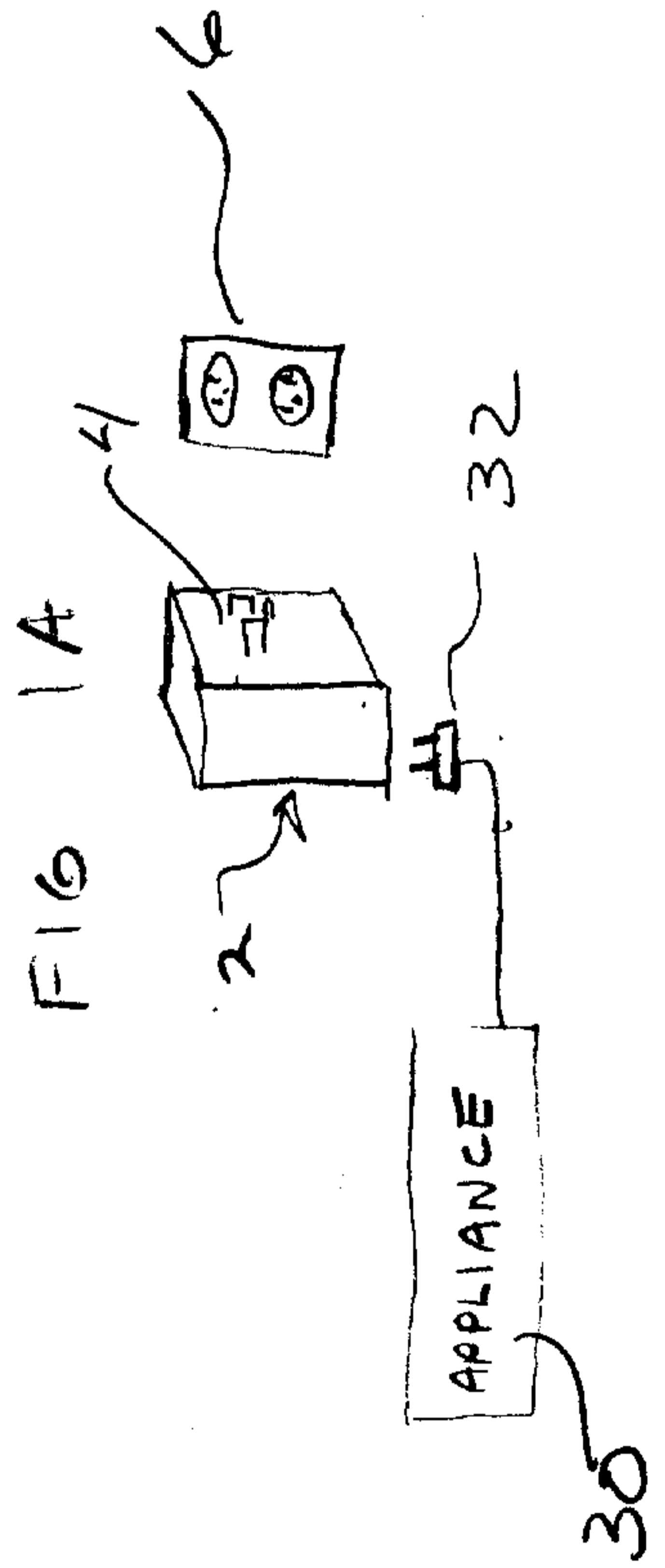


FIG 1A

FIG 1C

Functional Diagrams of Variations
Basic Operation

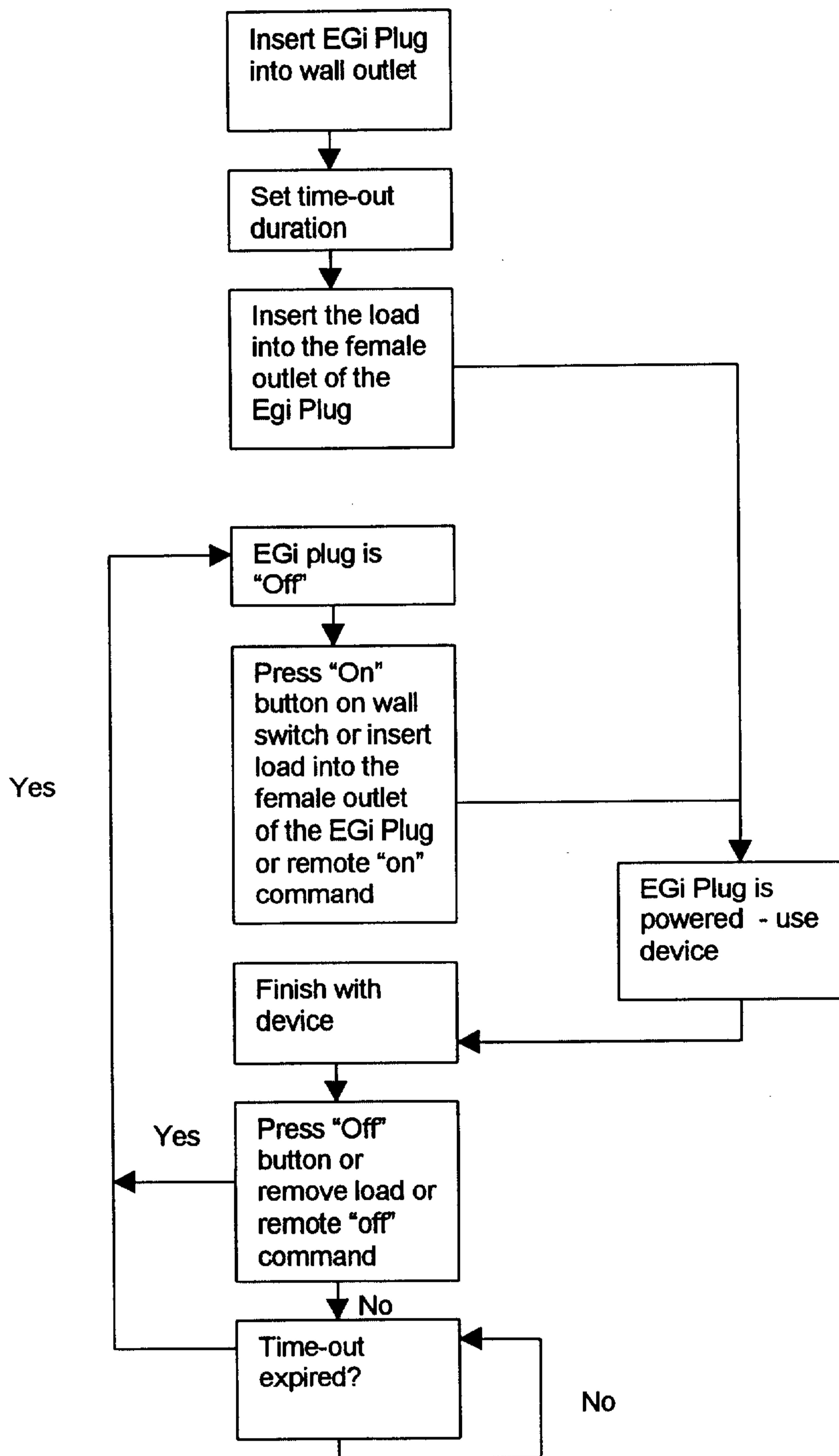


FIG. 2

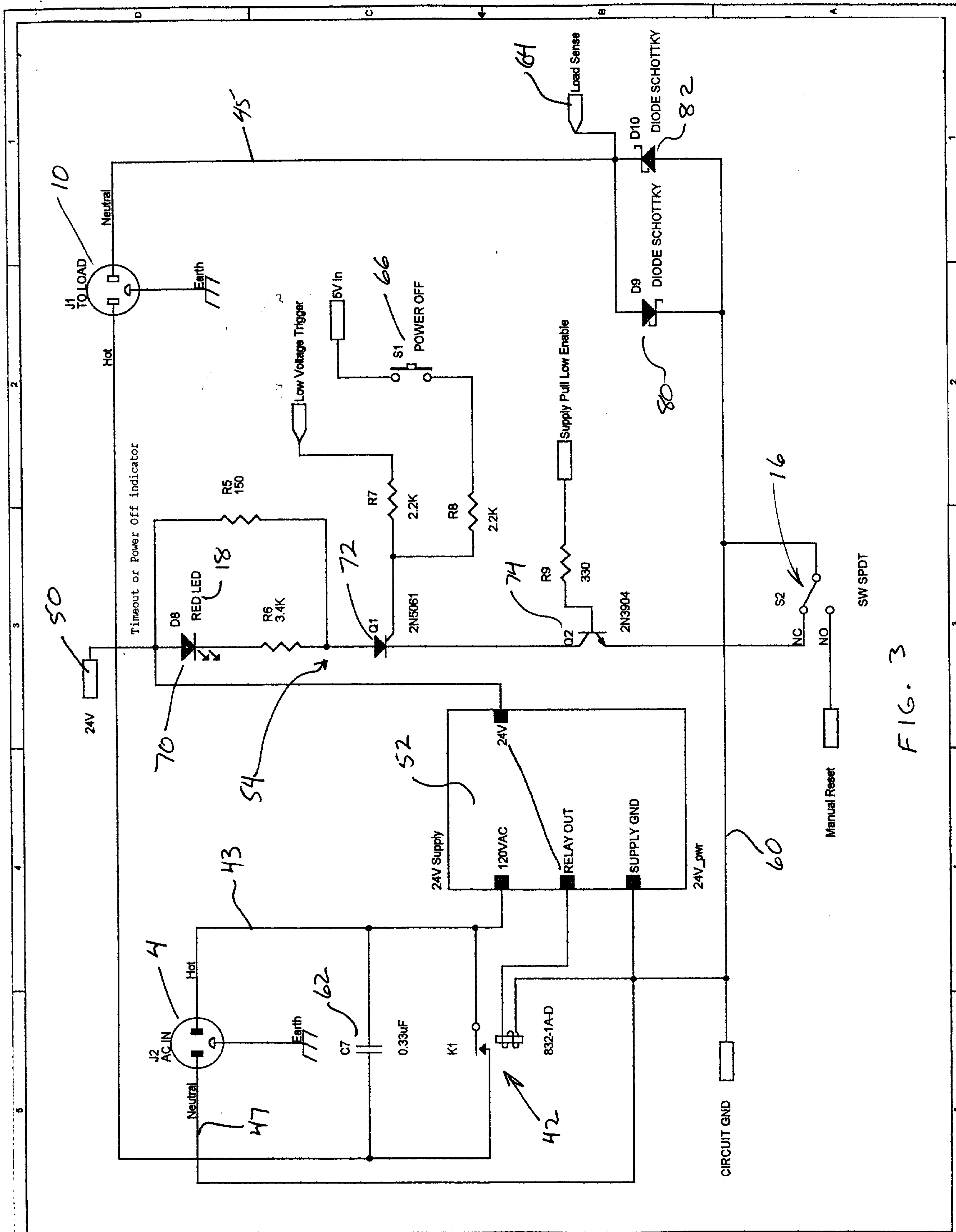


FIG. 3

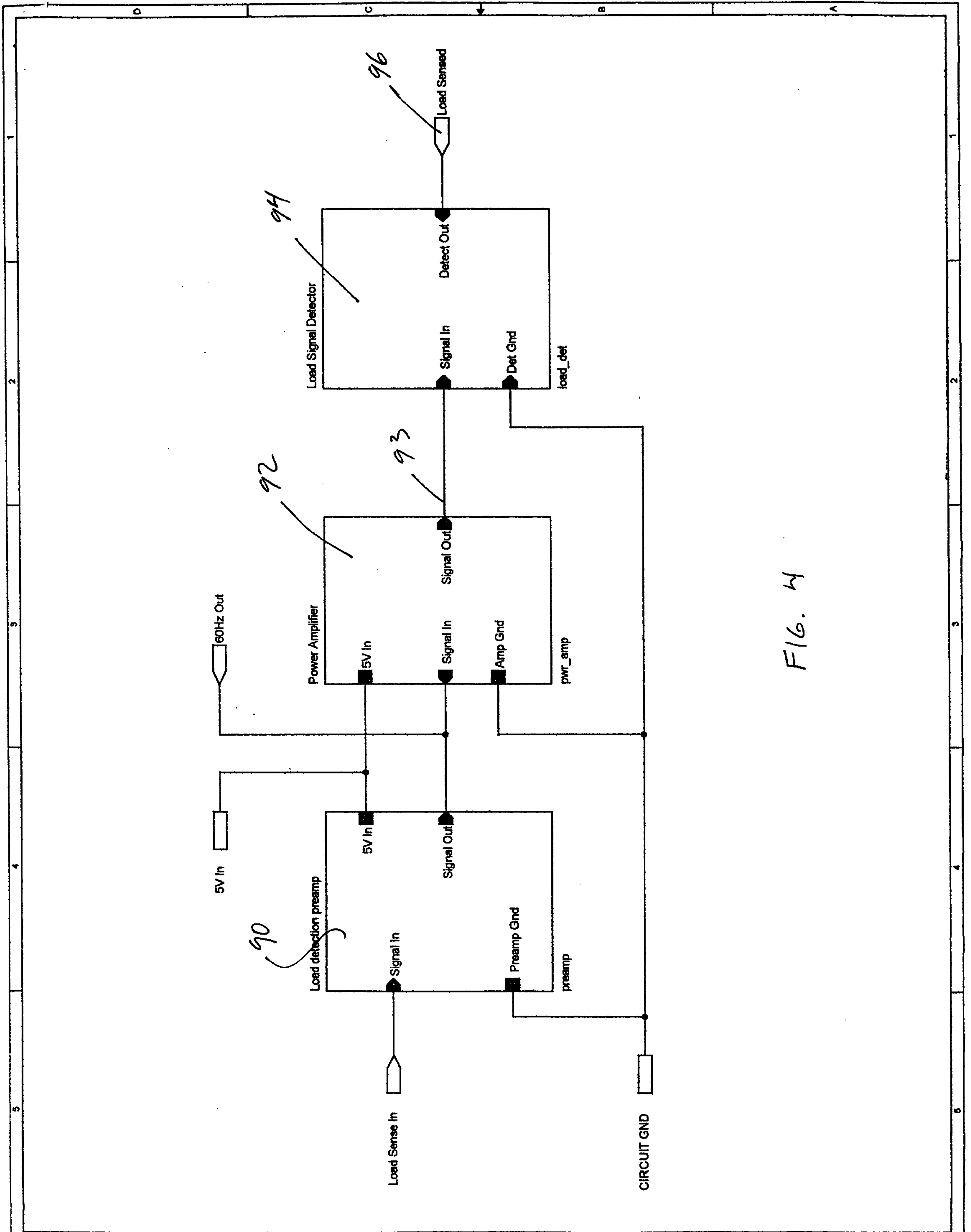


FIG. 4

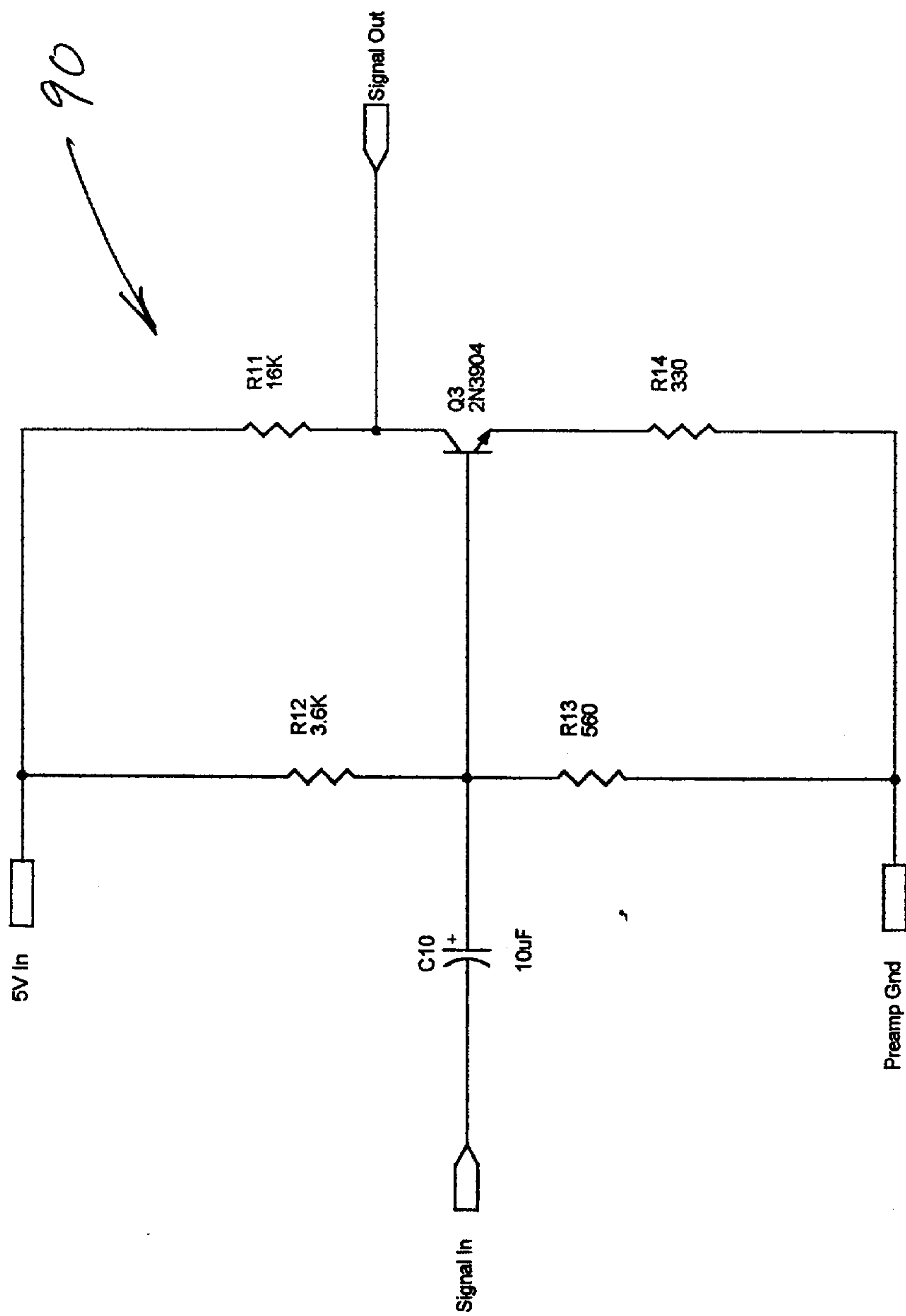


FIG. 5

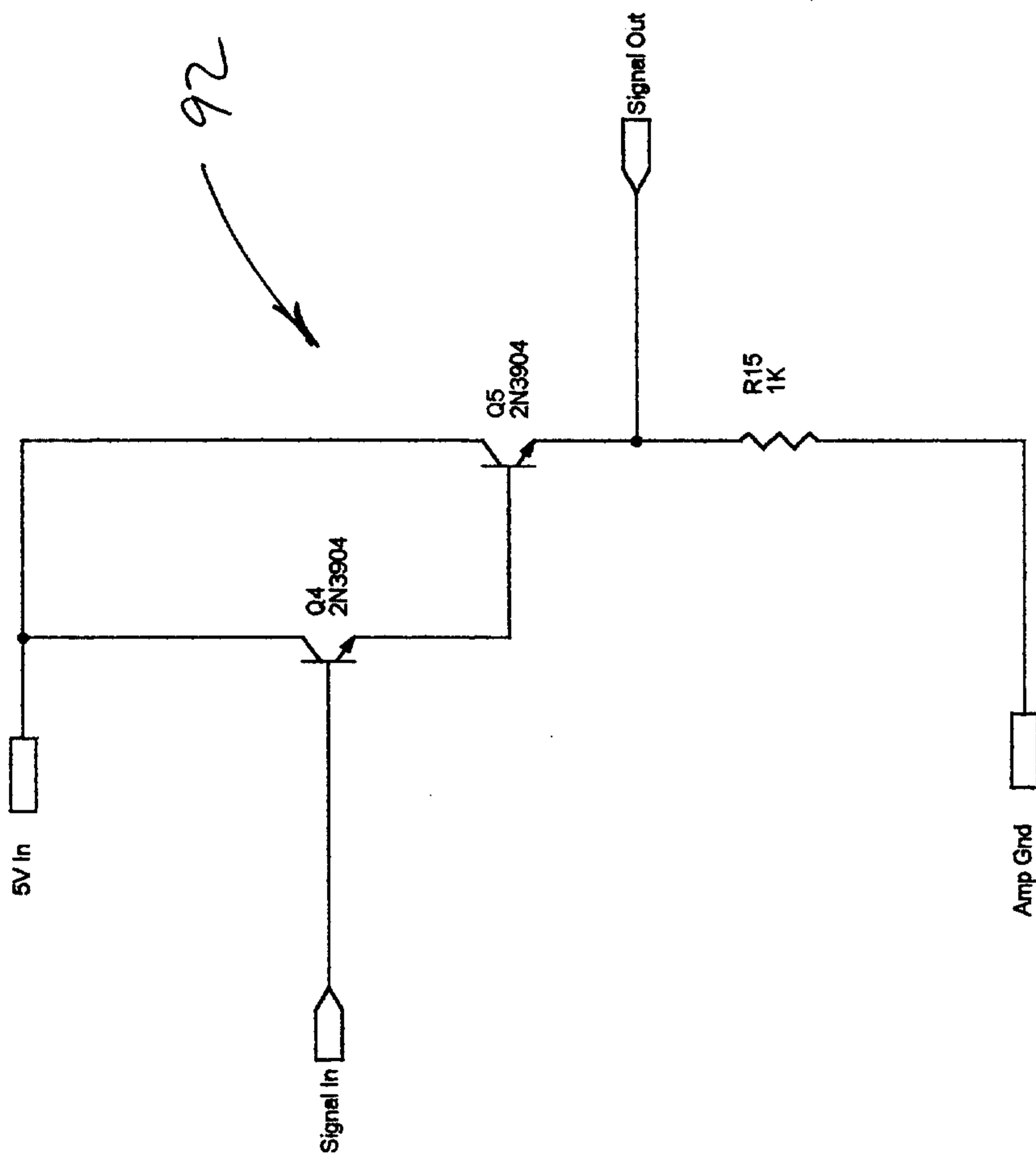
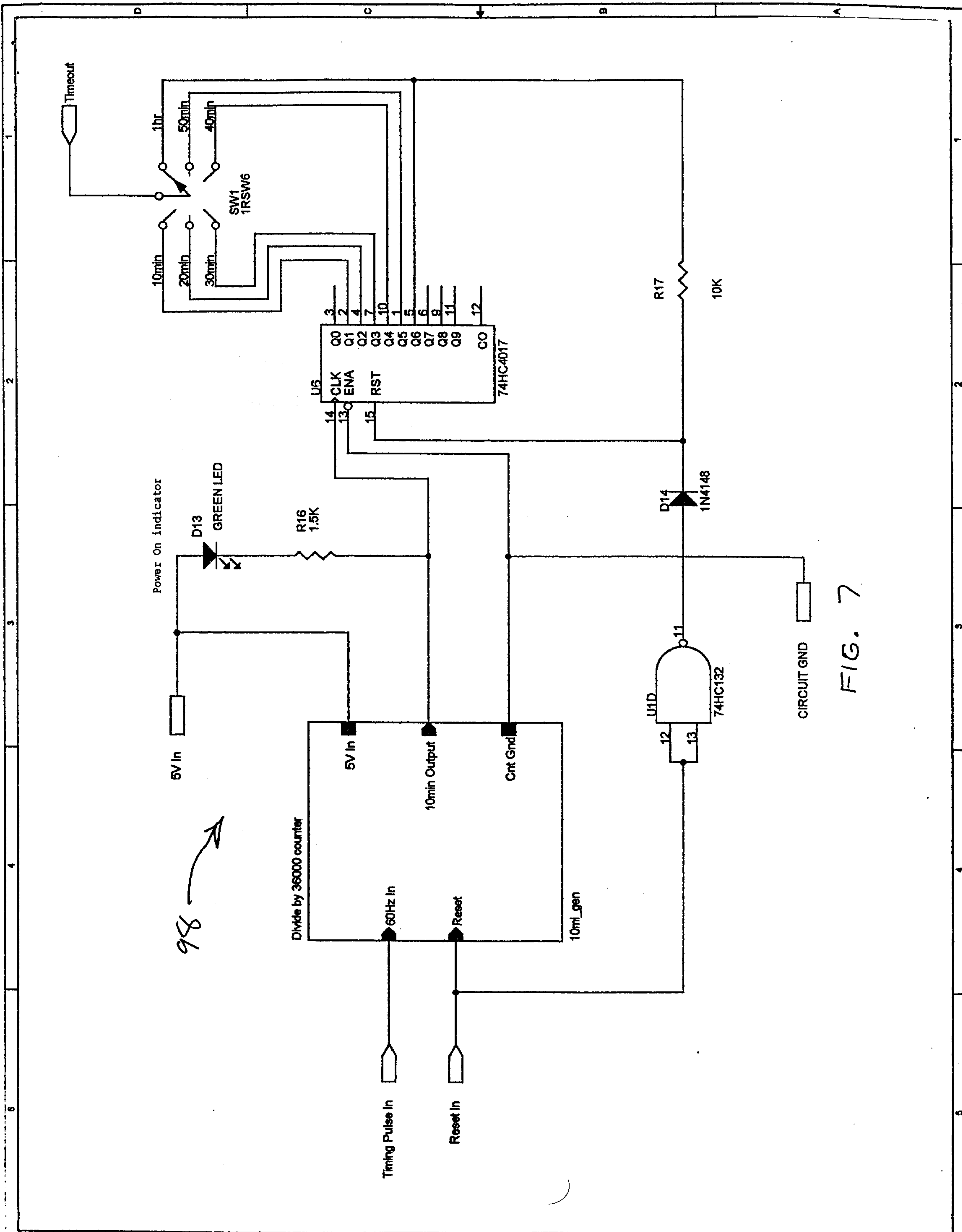


Fig. 6



98 ↗

FIG. 7

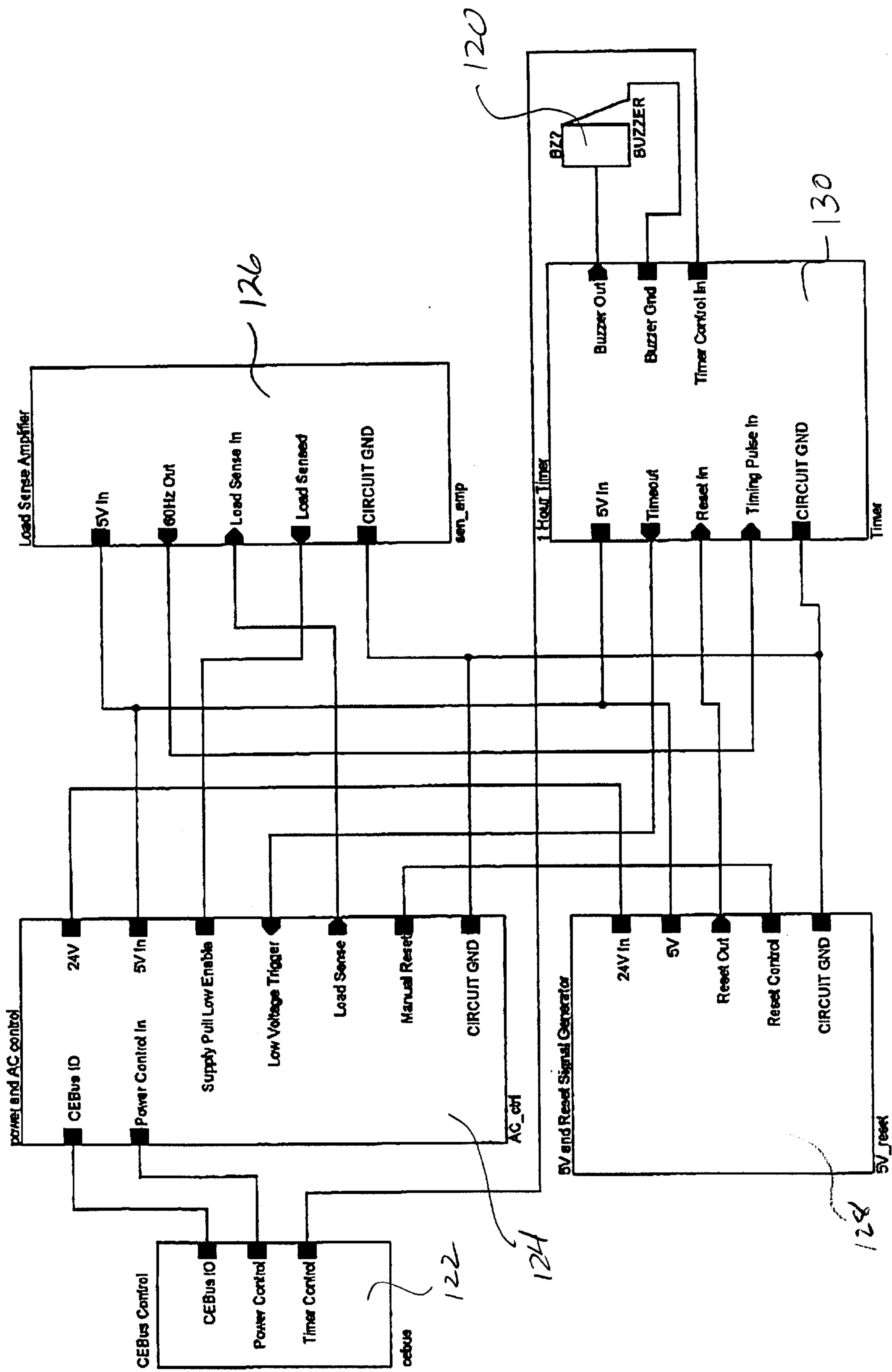


FIG. 8

