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TWO LIVE WIRE REMOTE CONTROLLER

Background of the Invention

The present invention relates to the concept and application of a low voltage remote
5 controller which includes a base controller which employs only two live wires which derives
it's own DC power supply, and, to a remote controller. The remote controller of the present
invention is particularly useful to remotely control the operation of various devices, such as
the on/off and variable power functions of incandescent and fluorescent lights and motorised
devices.

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Preferably, said controller is an infra-red (IR) remote control device.

Description of the Prior Art

Various devices are presently known for controlling the on/off and dimming functions
15 of lighting systems and variable speed control of motor devices.

Most of these presently known devices are employed in AC power distribution
systems, and incorporate ICs, variable transformers, silicon control rectifiers, triacs and
external DC sources. Such devices are generally hard-wired 3-wire systems.

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Such 3-wire systems cannot perform the dimming function for fluorescent lights and
like devices without incurring high cost.

Summary of the Invention

25 The present invention seeks to provide a remote controller which overcomes at least
some of the disadvantages of prior art controllers.

The present invention seeks to provide a remote controller which is able to control the
on/off and/or dimming functions of a variety of devices, including incandescent and
30 fluorescent lighting devices and/or variable speed devices.

The present invention also seeks to provide a remote controller which derives its own power supply, which is of low voltage and provides for low power consumption.

In one broad form, the present invention provides a remote controller for controlling
5 the on/off and/or dimming functions of a lighting unit or motorised device, wherein said remote controller comprises a two live wire system.

Preferably, said remote controller includes a DC power supply circuit to derive its own low voltage DC power supply to operate said remote controller.

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Preferably, said DC power supply circuit derives its own low voltage DC power supply from the residue voltage of a triac of said remote controller.

Alternatively, but also preferably, said DC power supply circuit derives its low voltage
15 power supply from an RC circuit to drive a relay of said remote controller.

In a preferred form, said remote controller is used to drive at least one incandescent lighting device and/or inductive 'motor' device.

20 In an alternatively preferred form, said remote controller is used to drive at least one fluorescent lighting device.

Preferably, said controller is an infra-red (IR) remote control device.

25 In the first preferred embodiment, said power supply circuit (Fig. 2) includes a clamping circuit and a half-wave rectifier to derive said DC supply whilst said triac is in its ON state.

In this form, preferably, said clamping includes a zener diode (D1), and, said half-
30 wave rectifier includes a diode (D2) and capacitor (C1).

In the second preferred embodiment, said power supply circuit (Fig. 5) includes an RC circuit (R9,C5) for voltage reduction, and a rectifier (D2,C1).

Brief Description of the Drawings

5 The present invention will more fully understood from the following detailed description of a preferred but non-limiting embodiment thereof, described in connection with the accompanying drawings, wherein:

Fig. 1 shows a circuit diagram of a two live wire, low voltage, remote controller, suitable for incandescent devices and inductive 'motor' devices, in accordance with a first
10 embodiment of the present invention;

Fig. 2 shows a power supply circuit for the dimmer control circuit of Fig. 1;

Fig. 3 illustrates cycle diagrams for the circuit of Fig. 1, in particular detailing the on/off conducting cycles;

Fig. 4 shows a second embodiment of the present invention, and illustrates a circuit
15 diagram for a two live wire, low voltage, remote controller, suitable for fluorescent devices; and,

Fig. 5 shows the power supply circuitry for the on/off controller of Fig. 4.

Detailed Description of Preferred Embodiment(s)

20 In Fig. 1 is shown a circuit diagram of a dimmer controller in accordance with a first preferred embodiment of the present invention. The circuit of Fig. 1 incorporates its own power supply circuitry which enables it to generate its own low voltage, DC power supply.

For ease of understanding, Fig. 2 separates the components of the power supply
25 circuit of Fig. 1.

The circuit shown in Fig. 1 is suitable for controlling incandescent lighting devices and inductive 'motor' devices, and employs the use of a triac. It is the residue voltage of the triac during its OFF states which is utilised to generate the DC power supply.

Cycle diagrams are illustrated in Fig. 3, from which persons skilled in the art will understand that the power supply voltage is obtained during the OFF state of the triac. A residue voltage of typically 15 - 20 volts is available when the triac begins to turn on as shown in Fig. 3(c). In this embodiment, the firing angle of the triac should typically be a minimum of 30 degrees, as shown in Fig. 3(b).

During the OFF states of the triac, an average voltage of 220V is constantly available across the triac which acts as the source for the controller. The zener diode (D1) in Fig. 2 is used to clamp the voltage at 5.6V whereby the diode (D2) and capacitor (C1) function as a halfway rectifier to generate the DC supply for the controller components when the triac is in the ON state.

A typical implementation of a remote controller uses an LS7232 as the triac driver IC1; an HT12D IR as decoder IC2, and a TFMS5380 as IR receiver IC3, to control incandescent or inductive devices.

It will be understood that the circuit of Fig. 1 illustrates the function of using the residue voltage from the triac during it's OFF state to derive the DC source for the electronics, using a two wire system, to control incandescent devices or inductive "motor" loads.

Whilst the embodiment shown in Figs. 1 to 3 is suitable for controlling the operation of incandescent lighting devices and inductive 'motor' devices, it is unsuitable for fluorescent devices.

Fig. 4 shows a circuit diagram of an ON/OFF controller in accordance with a second embodiment of the present invention, which, in this case, is suitable for controlling fluorescent devices.

As with Fig. 1, Fig. 4 also incorporates its own power supply circuitry which enables

it to generate its own low voltage DC power supply.

As with Fig. 2, Fig. 5 separates the components of the power supply circuit of Fig. 4, for ease of understanding.

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Instead of using a triac, as was used in Fig. 1 for incandescent and inductive devices, a relay is used to control of ON/OFF and dimming functions for fluorescent devices.

The DC power supply for the relay control circuit is obtained through using RC
10 components. The operational procedures are as follows.

When relay K2 is in the OFF state, no current will flow through the relay. The resistor R9 and capacitor C5 is then used to reduce the voltage to 5.6VAC, which is then rectified by diode D2 and capacitor C1.

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However, when the relay is in the ON state, the relay contacts close, the zener diode D1 clamps the voltage at 5.6VAC, which is then rectified to provide the DC source when the relay is in the ON state.

20 The resistor R9 and capacitor C5 also provide arc suppression for the relay contact, when the relay contact breaks. Thus, the circuit in diagram 5 will always maintain a constant 5V DC source for the controller during and when the relay is either ON or OFF.

As such, it will be understood that the circuit of Fig. 4 illustrates the use of RC
25 components to drive the DC power to operate the relay during relay ON and OFF state for fluorescent devices.

A typical application illustrated here uses HT12D as IR decoder IC2, TFMS5380, as IR receiver IC3 and 74HC74, 75HC123 as logic device IC1A and IC4A respectively to
30 facilitate the possibilities for local / remote operations to control fluorescent devices.

It will be appreciated that both embodiments of the present invention employ two live wires only, achieving remote control abilities at a very low cost compared with 3-wire and other hardware systems.

5 As this invention uses a localised DC source at the control point, either derived from the residue voltage of the triac or powered from RC circuits to drive the relay in the two live wire system, it provides a low cost solutions in place, of or as an alternative to, the three wire, hard wire applications.

10 In this invention, there is no hard wire requirement. Transformer devices and any external DC sources to drive the controller, are eliminated in this system, thus permitting wireless control for each individual control point in the system.

By integrating with commercially available decoders, IR detectors, logic device, micro
15 controllers and other integrated circuits into the circuitry of the present invention, vast applications and functions are achievable such as lighting ON/OFF and dimming controls, fan speed control, etc. such as is typically required in building automation industries.

Functions such as timer control for ON/OFF, memory function for last chosen setting,
20 and provision of a plurality of channels (e.g. 16 channels) are permissible in the system.

The extreme versatility of this invention enables the use of relatively low cost components to be incorporated in an hybrid circuit, yet achieving the objectives of remote capabilities in a relatively inexpensive manner.

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Furthermore, the miniaturisation of the controller of the present invention is made possible, such that the device fits into any standard market size casing of the switching devices. With the low power consumption of the electronic components and available DC power source in standard casing, up to 3 circuits (load) can be controlled.

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The present invention can also be integrated to most of the lighting systems available commercially in the marketplace with only minor modification and changes required to the system.

5 The present invention also provides linear controls to all dimming process and speed control.

The circuits in the preferred embodiment of the invention can be employed with a number of electrical systems, but the most cost effective application is to eliminate the pre-
10 wired, three-wire systems for remote, programmable controls in both residential and commercial building automation systems.

In this preferred embodiment of this invention, the DC source is independent and available at each control point without using a conventional transformer which is provided in
15 most systems which incorporate a central DC supply (hard wire). In the event of failure of the central DC supply of prior art systems the complete system will collapse. It also conserves energy as it uses residue power to power up the electronics.

In this invention wireless control and programming is used. Features such as time or
20 clock control functions are programmed through the wireless IR communication system.

In this invention, the features of this controller is able to be enhanced easily and are adaptable to most commercial available building automation system as universal protocols are used in the IR communications. Its IR communications does not generate electromagnetic
25 interference, as compared to RF communications systems used.

It will be appreciated that particular embodiments of the present invention have been herein described. It will be understood by persons skilled in the art that numerous variations and modifications will become apparent. For example, different electronic components may
5 be used to perform a similar function. All such variations and modifications which become apparent to persons skilled in the art should be considered to fall within the scope of the invention as herein described and as hereinafter claimed.



The claims defining the present invention are as follows:

1. A remote controller for controlling the on/off dimming functions of a lighting and/or motorised device, wherein said remote controller comprises a two live wire system.
- 5 2. A remote controller as claimed in claim 1, wherein said controller includes a DC power supply circuit to derive its own low voltage DC power supply to operate said remote controller.
3. A remote controller as claimed in claim 1 or 2, wherein said DC power supply circuit
10 derives its own low voltage DC power supply from the residue voltage of a triac of said remote controller.
4. A remote controller as claimed in claim 1 or 2, wherein said DC power supply circuit
15 derives its low voltage power supply from an RC circuit to drive a relay of said remote controller.
5. A remote controller as claimed in claim 3 or 4, wherein said remote controller is used to control at least one incandescent lighting device and/or inductive 'motor' device.
- 20 6. A remote controller as claimed in claim 2 or 4, wherein said remote controller is used to control at least one fluorescent lighting device.
7. A remote controller as claimed in any one of claims 1 to 6, wherein said controller is an infra-red (IR) remote control device.
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8. A remote controller as claimed in claim 2, wherein said power supply circuit (Fig. 2) includes a clamping circuit and a half-wave rectifier to derive said DC supply, whilst said triac is in its ON state.



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9. A remote controller as claimed in claim 8, wherein said clamping includes a zener diode (D1), and said half-wave rectifier includes a diode (D2) and capacitor (C1).

10. A remote controller as claimed in claim 3, wherein said power supply circuit (Fig. 5) includes an RC circuit (R9,C5) for voltage reduction, and a rectifier (D2,C1).

11. A remote controller, substantially as herein described with reference to the accompanying drawings.