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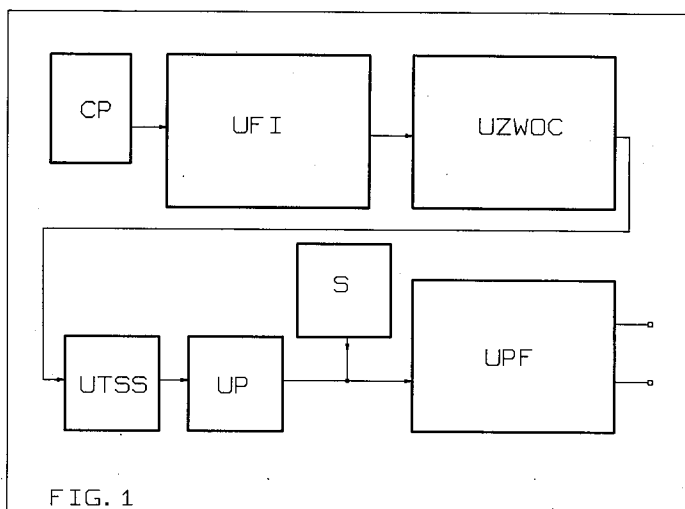
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**EUROPEAN PATENT APPLICATION**(21) Application number: **92121831.9**(51) Int. Cl.<sup>5</sup>: **H05B 39/08, G08C 23/00**(22) Date of filing: **22.12.92**(30) Priority: **14.01.92 PL 293199**(43) Date of publication of application:  
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W-8000 München 81 (DE)**(54) **Methods of operation and circuit of a remote control system.**

(57) Remote control of power devices is described e.g. electric bulbs of lighting installations, by use of any remote control transmitter, primarily designed for an audio-video equipment. An infrared signal transmission method is used and in order to control a power receiver the signal derived from an infrared transmitter is used with discretionary ways of modulation. The signal is reproduced in the shape of a string of impulses (logical "zero", logical "one") and

its duration is proportional to the duration of a signal excitation source of a guiding transmitter.

The circuitry, is characterized by an impulse-forming circuit (Ufl) connected to an infrared sensor (CP) and to input and delay counter (UZWOC) and furthermore, to a control signal forming system (UTSS). Signal forming circuitry (UTSS) through the intermediate circuit (UP) is connected to phase shift circuitry (UPF) and to a further sensor (S).

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The subject of the invention is the circuit and application method of remote control, especially of a power regulator for electric appliances. There are well known system designs ready to turn on / off or regulate power of any active receiver system supplied from AC mains.

Controlled regulation of such a regulator is done by an immediate action of a user e.g. with use of slide or rotary resistor or sensing element e.g. sensor. Turning the working voltage on or off is done with the use of a typical switch-off device or by the use of a sensor.

There are known power remote control designs as well, and exemplified in power receivers controlled by an ultrasound or an infrared signal. The power receiver in cooperation with a transmitter reacts only to one particular kind of signal. There are known designs of remote controlled regulation of audio video systems with use of an infrared signal.

The condensed signal contains coded information which is sent by the transmitter and further received and decoded by receiver circuitry.

Our invention uses a remote signal transmission method such as infrared and the chief point of the matter is that in order to control a power receiver, the signal derived from a remote transmitter with discretionary ways of modulation is used. The signal is reproduced in the shape of a string of impulses (logical "zero" and logical "one"), and its duration is proportional to the duration of a signal excitation source i.e. from the remote transmitter.

The inventive system consists of a transmitter and a receiver such as an infrared or ultrasound receiver. The receiver is furnished with a sensor such as an infrared sensor and is connected to a regulated phase shift circuit, which acts in conjunction with a power receiver. There is an impulse forming system connected to the sensor and furthermore, to an input and delay counter system. The input and delay counter system is connected to control signal forming circuitry and through the intermediate system, is connected to a phase shift circuit and a further sensor. The impulse forming system consists of RC circuitry and is connected to two RC systems (part of the input and time delay circuitry), and to the counter and with a control signal forming generator made of diodes it forms an AND operation. The intermediate circuit consists of an inverter and diodes.

The advantage of this invention design is the possibility of remote control of a power receiver e.g. electric bulb of a lighting installation, by use of any kind of a remote control transmitter primarily designated for an audio-video usage.

The inventive design is explained as shown in Fig. 1: The block diagram of the receiver system remotely controlling power regulator. In Fig. 2: The

schematic diagram of the circuit.

The remote control receiving system will be described with respect to an infrared sensor CP connected to impulse-forming circuitry UFI and connected to an input and delay counter UZWOC and furthermore, to a signal control generator UTSS. However, the invention is not limited to infrared transmission. Control signal generator circuitry UTSS, is connected through the intermediate circuit UP, to a phase shift circuit UPF and to the further sensor S.

The impulse character of the signal derived from an infrared transmitter (with discretionary ways of modulation), is received by the infrared sensor CP and is changed to a signal with constant characteristics (by use of signal forming circuitry), much more suitable for the further control of the system. The controlling signal has a sequence of logic signals: "zero" and "one", with constant timing proportional to the time duration of the controlling signal source derived from the transmitter i.e. for the time duration of the remote control transmitter inputs. Input and delay counter UZWOC, forms a signal which counts and compares quantities of inputs and also delays the counting process for about 1 second in order to eliminate accidental interferences arising from the use of impulses coming from a different source of infrared signals. The main task of the control signal forming circuitry UTSS, is to create a control signal, and to make a phase shift circuitry UPF active in effect of fulfilling a certain sequence of input requirements. Intermediate circuitry UP, makes possible signal transfer from the control signal forming circuitry UTSS to the proper signal suitable for a phase shift circuitry UPF.

Impulse-forming circuitry UFI can be in a form of a counter or an RC system. Input and time delay counter UZWOC can be in the form of a counter, counter generator or a register. Phase shift circuitry UPF is in the form of a commercial IC, and is working in accordance with a producer data sheet. The inventive design consists of: an impulse-forming circuitry UFI in the form of an RC system, input and delay system UZWOC in the form of a counter and the phase shift system UPF which consists of a commercially available IC: SLR 0586, as shown in Fig. 2.

Operation of the system with a local control is as follows:

Touching of a sensor S changes input condition of IC U3, in the phase shift circuitry UPF, from high to low and produces a carrier wave on its output. It does or does not trigger silicon-controlled rectifier TRI and in consequence, it causes a turn on or off condition of the receiver's AC power supply. Touching sensing element S by a finger for a longer time causes appearance of a phase shifted

signal on the circuit output, which is proportional to the regulation timing. Such a procedure enables, depending on the output state, increase or decrease of a power supply to the receiver.

Working condition of the system with a remove control operation is as follows:

Impulses from an infrared sensor CP through inverter U2E charge capacitor C9, and change an output state of a gate of U2C to zero, allowing discharge of capacitor C8 and through the diode D2 and resistor R16, discharge of capacitor C1. After about 1 second duration of excitation impulses, capacitor C1 discharges changing at the very same time output state RST of a counter U1 to logical "zero" and unlocks counter into the position ready to count. In case of a lack of excitation impulses, capacitor C9 discharges after about 200 ms., and as a result, changes the output state of the gate of U2C to logical "one" and makes diodes D1 and D2 choke. When capacitor C8 starts to discharge through resistor R8, it changes input state CLK of a counter U1 to logical "one" after about 200 ms. from the moment of last impulse. Capacitor C1 discharges through resistor R1 after about 2 seconds. During that time, counter U1 remains still "count ready", because input state RST equals zero.

If, before discharge of capacitor C1, infrared sensor CP detects additional excitation impulses, the cycle is repeated again with such a difference that the following impulses follow much faster one after another (capacitor C1 is still charged). The cycles caused by changeable states of capacitor CS cause falling counting slope by counter U1. The amount of inputs necessary to cause phase shift system UPF activation, is determined by diodes D3 and D4. If diode D3 is inserted, then after the second negative impulse on capacitor C8, an output Q1 of a counter U1 changes its state to "one", which in connection with an existing logical state "one" on gates output of U2A, causes change of input state of U2B gate to logical "one". Subsequently, gate output of U2B changes to logical "zero" and through the diode D11, finds lead No. 5 of U3, which causes defined reaction according to timing of the excitation impulses.

The combinations are:

First input; (below 1 second) - no reaction

First input; (higher than 1 second) - counters stand by

Second input; (below 400 ms.) - phase shift system (UPF) turns on or off

Second input (higher than 400 ms.) - power regulation

Fabrication of the circuitry is not critical and it can be assembled in any chosen way. It can have the form of a separate unit powered from AC mains with connected receiver or, it can be mounted

inside receiver housing e.g. inside a junction box of a lighting installation.

## Claims

1. Remote control system comprising an infrared transmitter and an infrared receiver, said infrared receiver having an infrared sensor (CP), an impulse generator (UFI), an input and time delay counter (UZWOC), a control signal generator (UTSS), an intermediate circuit (UP) and a phase shift circuit (UPF) all connected in series, said phase shift circuit regulating the power of a power receiver.
2. Remote control system according to claim 1, wherein said impulse generator includes an RC circuit (R9;C9).
3. Remote control system according to claim 1 or 2, wherein said input and delay counter (UZWOC) includes two RC circuits (R1,C1;R8,C8) and a counter (U1).
4. Remote control system according to any of claims 1 to 3 wherein said control signal generator (UTSS) is an AND element including diodes (D3,D4,D9).
5. Remote control system according to any of claims 1 to 4, wherein the intermediate circuit (UP) includes an inverter (U2B) and a further diode (D11).
6. Remote control system according to any of claims 1 to 5, wherein said signal is an infrared signal.
7. Method of operation of a remote control system for controlling a regulator, comprising:
  - (a) receiving a signal from a transmitter,
  - (b) wave shaping received signal to a series of digital pulses;
  - (c) controlling the regulator depending upon the duration of the signal.
8. Method according to claim 6, wherein the signal is an infrared signal.

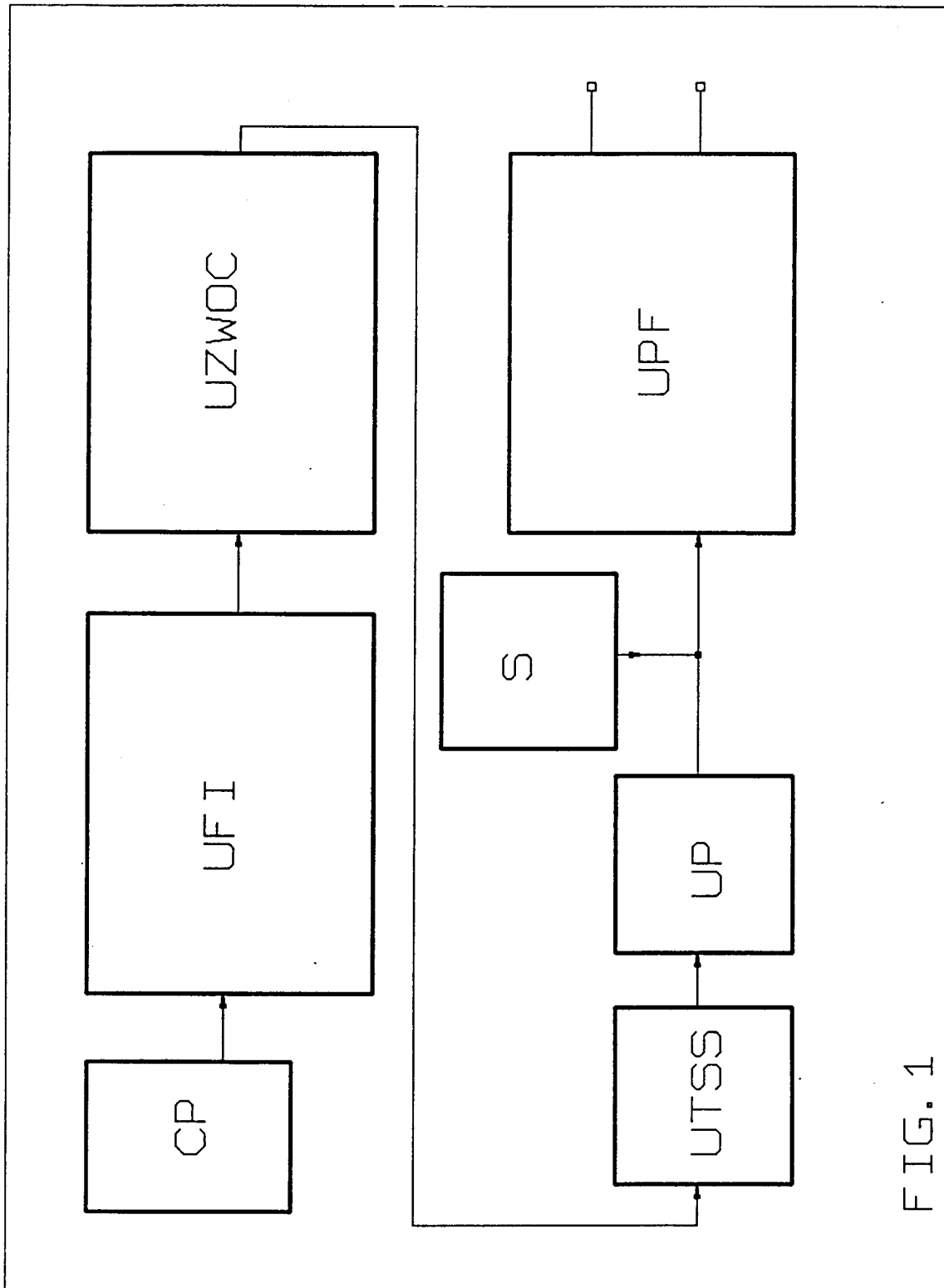


FIG. 1

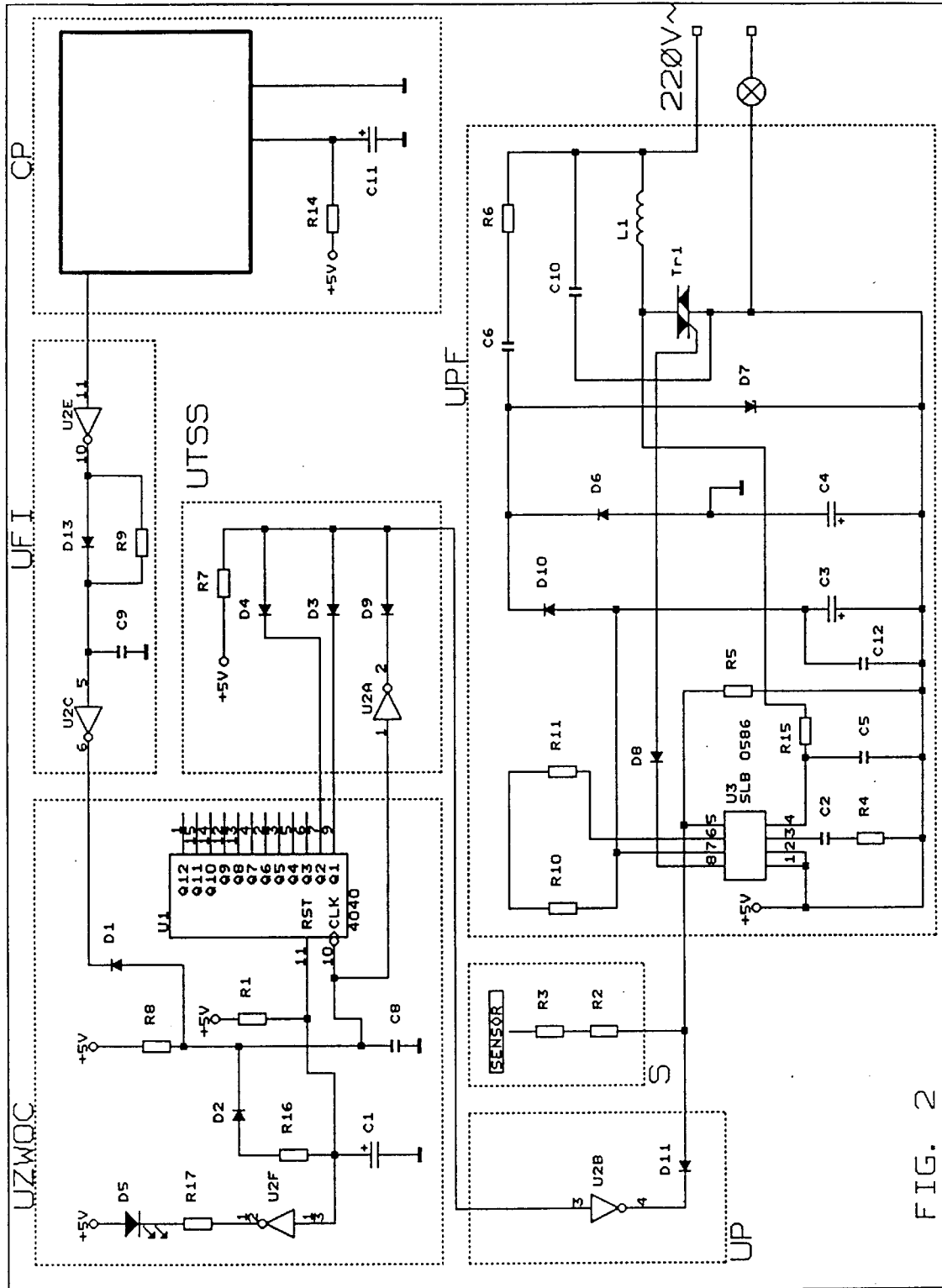


FIG. 2



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## EUROPEAN SEARCH REPORT

Application Number

EP 92 12 1831

### DOCUMENTS CONSIDERED TO BE RELEVANT

| Category                                                                                                                                                                                                                                                                              | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                    | Relevant to claim                               | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------|
| A                                                                                                                                                                                                                                                                                     | ELEKTOR ELECTRONICS<br>vol. 17, no. 188, April 1991, LONDON<br>pages 54 - 58<br>H.PETER 'dimmer for halogen lights'<br>* page 56, left column, line 29 - page 57,<br>right column, line 29; figures 3,4 *<br>--- | 1-8                                             | H05B39/08<br>G08C23/00                        |
| A                                                                                                                                                                                                                                                                                     | DE-A-4 003 581 (HORMANN)<br>* the whole document *<br>---                                                                                                                                                        | 1                                               |                                               |
| A                                                                                                                                                                                                                                                                                     | US-A-4 937 702 (KURIHARA)<br>* column 3, line 14 - column 6, line 36;<br>figures 1,2 *<br>-----                                                                                                                  | 1                                               |                                               |
|                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                  |                                                 | TECHNICAL FIELDS<br>SEARCHED (Int. Cl.5)      |
|                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                  |                                                 | H05B<br>G08C<br>H02J                          |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                            |                                                                                                                                                                                                                  |                                                 |                                               |
| Place of search<br>THE HAGUE                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                  | Date of completion of the search<br>17 MAY 1993 | Examiner<br>SPEISER P.                        |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                  |                                                 |                                               |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document                                                               |                                                                                                                                                                                                                  |                                                 |                                               |
| T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                                                                                                                                                                  |                                                 |                                               |