The invention relates to a circuit arrangement according to the preamble of the first claim.

It is known in the art that it has been possible to reduce the the power consumption of television appliances in recent years. However, that is not the case when the appliance is operating on stand-by. (That is the term for a remote-controlled appliance in a state of readiness.) Thus the ratio of power consumption while operating on stand-by to that in normal operation has progressively declined.

Circuit designs for stand-by operation of lower power requirements have already been developed, which,however, are of excessive circuit complexity.

A television receiver with IR remote control that is completely separated from the mains when operating on stand-by is described in DE-A1-31 37 081. The current required for stand-by operation is produced by means of solar cells. The design provides for the boosting of the solar cells with rechargeable batteries. It is possible, with CMOS preamplifiers and reception decoder circuits, to reduce the current consumption at c. 5V to values of the order of 1mA.

Further, DE-A1-32 42 333 has become known in the art, according to which one stand-by circuit for remote-controlled television receivers is provided in which the remote-control receiver 2 housed in the television appliance 1 is connected via a stand-by transformer 6 and a voltage stabiliser 10 to the mains, and in which a switching relay 11 is provided for connecting the television appliance 1 to the mains. By these means, the customary mains switch provided for the user, with a wiper contact for setting the switching relay 11, falls away. The object of the invention does not, however, set as its goal the requirement of a particularly low-power stand-by operation, which is accordingly not realised in the solution of the problem. The stand-by transformer 6 is constantly connected to the mains, a stand-by switch 9 at low voltage is provided between the mains and the voltage stabiliser 10, and the relay is set by a transistor 16, which receives differentiated switching pulses via a series circuit consisting of a capacitor 13 and a resistor 14 between the stand-by supply line 20 and mass. From the description of figure 1 it emerges clearly that the remote-controlled receiver 2, comprising the command decoder 3 and the mains flip-flop, and if necessary an amplifier and preamplifier not referred to, for the remote control signal, is constantly supplied during stand-by operation.

The object of the present invention was to develop circuit arrangements enabling considerably reduced power consumption during stand-by operation and not requiring great expenditure on the circuit.

This object is solved according to the invention in both solutions according to the preamble of patent claims 1 and 2, in accordance with their characterising features.

Further details may be obtained from the description of examples of embodiment.

According to the two circuit arrangements for the low-power stand-by operation of a television receiver, only the remote-control signal amplifier is supplied with current when operating on stand-by. It emits appropriate coded pulses when the remote control is operated. According to one of the solutions, these are fed to a signal stand-by circuit and to an evaluation circuit, wherein the latter is only supplied with voltage and put into operation once the prepared signal through-switches an electronic switch. If the evaluation circuit recognises the signal as a switch-on signal, it transmits a switch-on signal to the mains part of the television appliance and itself provides for the maintenance of its current supply via the electronic switch. However, if the evaluation circuit ascertains that the signals received do not correspond to the stipulated code, through-switching of the electronic switch is not maintained.

The other solution provides for the constant supply during stand-by operation of a rectified voltage from the mains to the remote control signal amplifier, with an optocoupler and a switched-mode power supply receptive to three switching levels working in tandem with the remote control signal amplifier. During stand-by operation it remains switched off (stand-by I). If the remote control signal amplifier receives signals from the transmitter, it transmits pulses to the switched-mode power supply, switching it over to stand-by . The same pulses simultaneously arrive , via the optocoupler that is required here for mains separation, at the evaluating circuit. The evaluating circuit recognises switch-on pulses and switches the switched-mode power supply over to its third switching level, that of normal operation, wherein a voltage is supplied to the television receiver and the evaluating circuit. If switch-on signals are not involved here, or if no further pulses to be recognised arrive from the remote control signal amplifier, then the stand-by II function of the switched-mode power supply is cancelled again, i.e. it is once again switched over to its first stand-by I switching level .

According to the two solutions, a manual control at the television receiver, if provided, must work in tandem with the evaluation circuit in such a manner that it is possible to switch on the television receiver directly.

The advantage of the two solutions consists in that in stand-by operation, i.e. remote-control stand-by, the remote control signal amplifier only requires a low supply of power. Thus the ratio of power consumption in stand-by operation to that in normal operation is considerably improved.

Two examples of embodiment are described in the following, with

reference to the diagram.

Figure 1 shows in principle a block diagram of the first solution.

Figure 2 shows in principle a block diagram of the second solution.

Similar blocks or componentry are given the same reference numbers in figures 1 and 2.

Figure 1 shows a circuit design in which a remote control signal amplifier 1 is supplied by a mains supply circuit 4 operating on stand-by, while all other current utilisers are still switched off. When the remote control signal amplifier 1 receives signals from a transmitter (not represented), it sends pulses to a connected evaluation circuit 5 and to a signal processing circuit 2, which through-switches the electronic switch 3 via the diode 11. The evaluation circuit 5 is thereby provided with a voltage, and tests the arriving pulses. If these are switching pulses according to the coding, then it maintains its voltage supply itself across the diode 9. Otherwise, if no further pulses come from the remote control signal amplifier 1, the switch 3 is switched off again by the signal processing circuit 2, by which means the circuit remains in stand-by operation. If, however, a switch-on signal is present and is recognised, the evaluation circuit 5 transmits the switch-on command via an L-signal to the mains supply circuit or switched supply of the television receiver. The electronic switch 3 can also be activated by the manual control 6, rather than by remote control, thus switching on the appliance. The evaluation circuit 5 then recognises that the appliance was switched on across the diode 10 by the manual control 6, and again ensures the maintenance of the current supply via the electronic switch 3. The energy required for this brief period is supplied by the electrolytic capacitor of the mains supply circuit 4.

In the example of figure 1, an evaluation circuit 5 with preferably a memory for the level most recently set is indicated by the connection of a battery 7 and a diode 8, so that the battery 7 delivers the minimum voltage required for the memory to function during stand-by operation. Upon switching on, this voltage is raised to its operating value via the electronic switch 3, and the evaluation circuit 5 is activated.

A connection is made from the stand-by mains supply circuit 4 via a diode to the mains supply circuit of the television receiver. This is meant to indicate that current is supplied via this connection as soon as a switch-on signal has led to the switching on of the television receiver.

Figure 2 shows a second example with splitting of the mains supply at the input (dot-dash line), in that a switched-mode power supply 12 with three switching levels is provided. In stand-by I operation (first level of switching), only the part of

the switched-mode power supply 12 indicated by the broken line is used, in order to supply the remote control signal amplifier 1 with voltage drawn from the 220V mains supply. As soon as the remote control signal amplifier 1 receives signals from the transmitter, it transmits pulses to the switched-mode power supply 12 which switch the latter over to the second switching level, stand-by II operation, and these pulses arrive simultaneously across an interposed optocoupler 13 at the evaluation circuit 5, usually a microprocessor, which henceforth obtains its required energy from the switched-mode power supply 12. Once the evaluation circuit 5 recognises that it is dealing with switch-on pulses according to the coding, the switched-mode power supply is switched over to its third switching level, that of normal operation, and the television appliance is thereby supplied with power. If, however, no recognition takes place, and no further pulses arrive, the switched-mode power supply returns to its first switching level, of merely stand-by supply of the remote control amplifier (stand-by I). The switched-mode power supply 12 and thus the television appliance may also be switched on directly by the manual control 6.

The particular advantage of this example of embodiment consists in that the switched-mode power supply 12 only goes over to the second switching level during operation of the remote control. By this means, as also in the first example described, a greater reliability of operation is ensured.



Patent Claims

1. Circuit arrangement for the low-power stand-by operation of a television receiver which is provided with a remote control signal amplifier (1), a signal processing circuit (2) if required, working in tandem with the remote control signal amplifier, an electronic switch (3), and an evaluation circuit (5), wherein the remote control signal amplifier (1) receives and amplifies remote control signals coming from a transmitter, and if required a signal processing circuit processes these signals, characterised in that during stand-by operation only the remote control signal amplifier (1) and possibly the signal processing circuit (2) are connected to a supply voltage drawn from the mains, and that the evaluation circuit (5) only switches over to the supply voltage via the electronic switch (3) when the remote control signal amplifier (1) receives pulses suspected of being words from a transmitter, and that the evaluation circuit (5) then recognises the subsequent pulses as switch-on pulses appropriately coded and thereupon activates the current supply of the television receiver, thereby maintaining its own current supply via the switch (3), while if the pulses are not recognised as switch-on pulses and no further pulses are suspected of being words, the current supply for the evaluation circuit is interrupted via the switch (3).

2. Circuit arrangement for the low-power operation of a television receiver, which receives,if necessary processes and transmits under amplification remote control signals coming as pulses from a transmitter, by means of a remote control signal amplifier (1), and is optionally furnished with a manual control (6), wherein an evaluation circuit (5) or decoder circuit, containing a mains flip-flop, works in tandem with the remote control signal amplifier (1) or both the remote control signal amplifier and the manual control in order to allow control by the user, and furnished with a switched-mode power supply (12) for supplying voltage to the television receiver, characterised in that the switched-mode power supply (12) is switched off at a first switching level (stand-by I) during stand-by operation, and that the remote control signal amplifier (1) is designed so that upon reception of remote control signals it delivers pulses via an optocoupler (13) to the evaluation circuit (5) and switches the latter over to a second switching level (stand-by II) by signal-processing means in the switched-mode power supply (12), thus supplying a voltage to the evaluation circuit (5), which then recognises the subsequent pulses appropriately coded as switch-on pulses, and only then switches the switched-mode power supply (12) over to its third switching level (normal operation), and supplies the television receiver, while otherwise the switched-mode power supply (12) is switched back to its first switching level (stand-by I).