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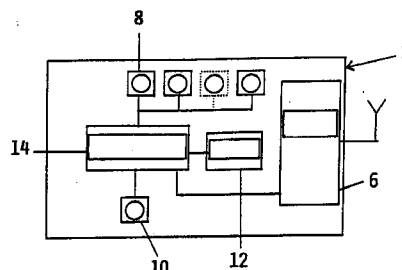
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(54) **Apparatus for transmitting and receiving encoded signals, particularly for remote control**

(57) An apparatus for transmitting and receiving encoded signals, particularly for remote control, comprising at least one transmitter (2) and at least one receiver (4), characterised in that:

- the transmitter (2) comprises a transmitting section (6), a microcontroller (14), a memory (12) with at least one resident code, means (10) for setting the receiver (4) to receive said code, and at least one key (8) associated with each code to transmit a correspondingly encoded control signal to said receiver (4), and
- the receiver (4) comprises a receiving section (16), a microcontroller (24), and a memory (18) in which the codes of transmitters scheduled to dialogue with said transmitter (2) can be memorized.

FIG. 1



Description

This invention relates to an apparatus for transmitting and receiving encoded signals, particularly for remote control.

Remote control apparatus are known, comprising one or more transmitters and one or more receivers able to dialogue with said transmitters to receive the signals transmitted thereby and transform them into control signals for the desired functions to be performed.

In order to obtain unequivocal dialogue between the transmitters and receivers, the signals emitted by the transmitters are encoded, ie are modified in accordance with a certain code, which can be recognized only by those receivers.

In a known encoding method, the receivers and transmitters use dip-switches, ie two or three-position multiple switches, ie two or three-position multiple switches, which have to be set to the same configuration in both stations. If n is the number of switches forming the dip-switch, the number of possible different combinations is 2^n or 3^n , the higher the number n the lower the possibility of finding two randomly equal codes.

A drawback of this known solution is that to set each transmitter and each receiver for mutual dialogue, each has to be directly adjusted. Whereas in the case of the transmitter this adjustment only involves the inconvenience of effecting the adjustment itself, in the case of the receiver considerable difficulties can sometimes arise, especially if the receiver is not easily accessible.

In another encoding method, during an initial self-learning stage the receiver is set to receive the code and to memorize it in suitable memory locations chosen either randomly or in a predefined manner, the code being generated in the transmitter by a random or non-random procedure and transmitted thereby to the receiver.

During operation, when the transmitter transmits an encoded signal to the receiver, this compares its code with those memorized, and if recognition occurs generates the control signal for the predetermined function to be performed.

This solution eliminates the discomfort of having to set the dip-switches in the transmitter and receiver, but does not eliminate the need to gain access to the receiver to set it for memorizing the codes of the transmitters which are to dialogue with it.

Other encoding methods are also known, using a portable palm-holdable terminal which can access the receiver memory to add new codes or to cancel previously memorized codes. This access to the receiver memory by the portable palm-holdable terminal can be achieved either by direct connection between the two devices by means of a cable, or by inserting the memory previously taken from the receiver into the terminal. However in either case the main problem of having to gain access to the receiver is not solved.

All these drawbacks are eliminated according to the invention by an apparatus for transmitting and receiving encoded signals, particularly for remote control, as described in claim 1.

A preferred embodiment of the invention is described in detail hereinafter with reference to the accompanying drawings, in which:

- Figure 1 is a simplified scheme of the transmitter of the apparatus according to the invention,
- Figure 2 is a simplified scheme of a receiver shown in the same view, and
- Figure 3 is a simplified scheme of the master transmitter shown in the same view.

As can be seen from the figures, the apparatus of the invention comprises as its essential elements one or more transmitters indicated overall by 2, and one or more receivers indicated overall by 4. For simplicity of description, reference will be made in this example only to one transmitter 2 and to one receiver 4.

The transmitter 2 comprises a transmitting section 6, for example of radiofrequency, a plurality of function keys 8, an enabling key 10 for the receiver 4, a memory 12 in which a number of codes equal to the number of function keys 8 are memorized, and a microcontroller 14 overseeing the operation of the transmitter 2. In the memory 12 the codes corresponding to the various keys are memorized by the actual manufacturer, and are indicated by a series number, for the reasons which will be apparent hereinafter.

The receiver 4 comprises a receiving section 16 tuned to the frequency of the transmitting section 6 of the transmitter 2, a random access memory 18, a memory cancellation key 20, an acoustic indicator 22 which signals the individual operating stages of the receiver, an overseeing microcontroller 24, and a plurality of outputs 26 for the various functions which the receiver has to control.

The apparatus of the invention also comprises a master transmitter 28, comprising a radiofrequency section 30, a keypad 32, a microcontroller 34 operated by said keypad 32, and a display 36 for displaying the operations set by the keypad and processed by the microcontroller 34.

The operation of the apparatus will be more apparent by dividing it into the initial installation, normal operation, subsequent installation and cancellation stages.

Initial installation stage

This stage requires the memory 18 of the receiver 4 to be empty or to have been completely cancelled by operating the key 20.

Under these conditions the user, wishing to insert the code of his transmitter 2 into the receiver 4, must firstly operate the key 10 of the transmitter 2 to feed an enabling signal to the receiver 4 which enables it for a

short time period (for example a few seconds) to memorize in its memory 18 the code of that transmitter 2. If the user now operates a function key 8 within that time period, the code corresponding to that key is transmitted to the receiver 4, which is able to memorize it in the first empty location of the memory 18, together with correlation data for that function.

The same operation can also be repeated for other possible function keys of that or other transmitters 2.

Normal operation stage

Under normal operating conditions, when a user operates a key 8 of one of the transmitters 2, the code of which has been previously memorized in the receiver 4, the encoded signal is received by said receiver, the relative code is reconstructed and is then compared with those present in its memory 18. If recognized, it causes a control signal to be generated for the function corresponding to the key pressed.

Subsequent installation stage

To insert the code of another transmitter 2 into the receiver 4, the key 10 of a transmitter 4 must firstly be operated, the code of which has already been inserted into the receiver, so as to set this latter to receive and to memorize the code of the new transmitter in the same manner as indicated for the initial installation.

This operation ensures that a new code can only be inserted in the presence of an already enabled transmitter and hence under conditions of absolute security.

Cancellation stage

The cancellation stage can be total, ie involve all the codes inserted into the memory 18 of the receiver 4, or be partial, ie involve only a single code.

In the first case access must be gained to the receiver 4 to be able to operate the key 20.

In the second case the operation can be performed in the simultaneous presence of an enabled transmitter 2, which by means of the key 10 causes the receiver to make its memory 18 accessible, and of the master transmitter 28, by which the series number (known) corresponding to that code of the transmitter to be cancelled can be keyed-in via its keypad.

From the foregoing it is apparent that the apparatus of the invention is particularly advantageous, in that:

- it enables the desired number of transmitters to be installed without having to gain access to the receiver; in particular it enables the receiver to memorize the code of the first transmitter, which becomes the master transmitter for inserting the codes of other transmitters,
- it provides conditions of absolute security during the installation of new transmitters, such installation

being possible only if an already enabled transmitter is present,

- it enables a transmitter code to be cancelled without having to gain access to the receiver; in particular it enables the code of a transmitter to be cancelled, using the same transmitter,
- it enables this cancellation to be effected under conditions of absolute security, this being possible only in the presence of the master transmitter, which is generally in the possession of the installer, and in the presence of an already enabled transmitter, in possession of the user.

The signals transmitted by the transmitter to the receiver can be radiofrequency signals, laser signals or light signals.

The apparatus of the invention can be used in various applications. One of these consists of the remote control of tubular motors for operating roll shutters, and motors for operating Venetian blinds. In this case the receiver is integrated into the motor and enables its functions to be totally controlled, including adjustment of limit switches if these are of electronic type. This is also valid if the receiver is external to the motor but, likewise, located in a non-accessible position.

Claims

1. An apparatus for transmitting and receiving encoded signals, particularly for remote control, comprising at least one transmitter (2) and at least one receiver (4), characterised in that:
 - the transmitter (2) comprises a transmitting section (6), a microcontroller (14), a memory (12) with at least one resident code, means (10) for setting the receiver (4) to receive said code, and at least one key (8) associated with each code to transmit a correspondingly encoded control signal to said receiver (4), and
 - the receiver (4) comprises a receiving section (16), a microcontroller (24), and a memory (18) in which the codes of transmitters scheduled to dialogue with said transmitter (2) can be memorized.
2. An apparatus as claimed in claim 1, characterised in that the transmitter (2) comprises a key (10) to enable the memory (18) of the receiver (4) to memorize codes of the transmitters (2) scheduled to dialogue with said receiver.
3. An apparatus as claimed in claim 1, characterised in that the receiver (4) comprises a random access memory (18).
4. An apparatus as claimed in claim 1, characterised in that the receiver comprises a cancellation key

(20) for the memory (18).

5. An apparatus as claimed in claim 1, characterised in that the microcontroller (24) of the receiver (4) is provided with outputs (26) corresponding to the different functions which said receiver (4) is able to control in response to the encoded signals fed by the transmitters (2) and received by the receiver. 5
6. An apparatus as claimed in claim 1, characterised in that the receiver (4) is provided with an acoustic indicator (22) with different tones for the different procedures underway. 10
7. An apparatus as claimed in claim 1, characterised by comprising a master transmitter (28) with a transmitting section (30), a keypad (32) and a microcontroller (34). 15
8. An apparatus as claimed in claims 2 and 7, characterised in that the master transmitter (28) is provided with means for causing within the memory (18) of the receiver (4) the cancellation of codes of transmitters (2) previously inserted into said memory (18), which is enabled for said cancellation by the key (10) of transmitters (2) whose code has been previously memorized in said memory. 20 25
9. An apparatus as claimed in claim 8, characterised in that said cancellation-causing means consist of said keypad (32) via which the master transmitter (28) transmits to the receiver (4) the series numbers of transmitter codes to be cancelled. 30
10. An apparatus as claimed in claim 1, characterised in that the transmitting section (6, 30) of the transmitter (2, 28) and the receiving section (16) of the receiver (4) operate on radiofrequency. 35
11. An apparatus as claimed in claim 1, characterised in that the transmitting section (6, 30) of the transmitter (2, 28) and the receiving section (16) of the receiver (4) operate with infrared signals. 40
12. An apparatus as claimed in claim 1, characterised in that the transmitting section (6, 30) of the transmitter (2, 28) and the receiving section (16) of the receiver (4) operate with visible signals. 45

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FIG. 1

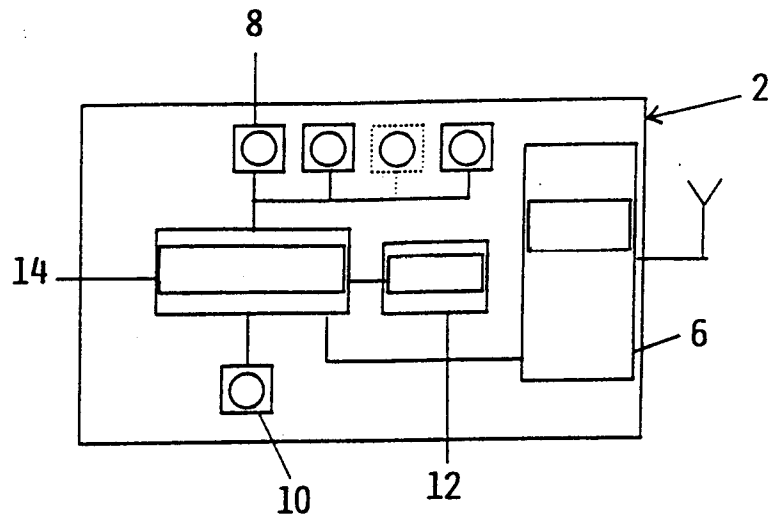


FIG. 2

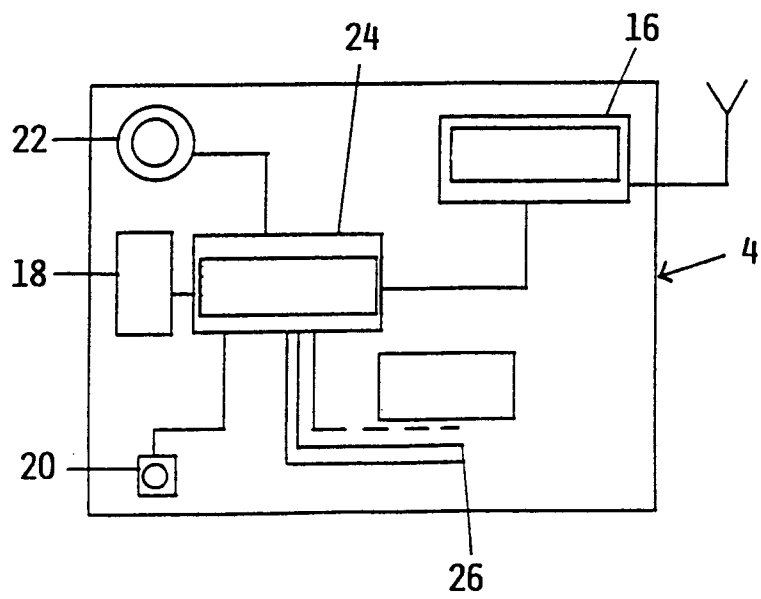


FIG. 3

