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(54) **REMOTE CONTROL SYSTEM AND SIGNAL CONVERTER OF THE SAME**

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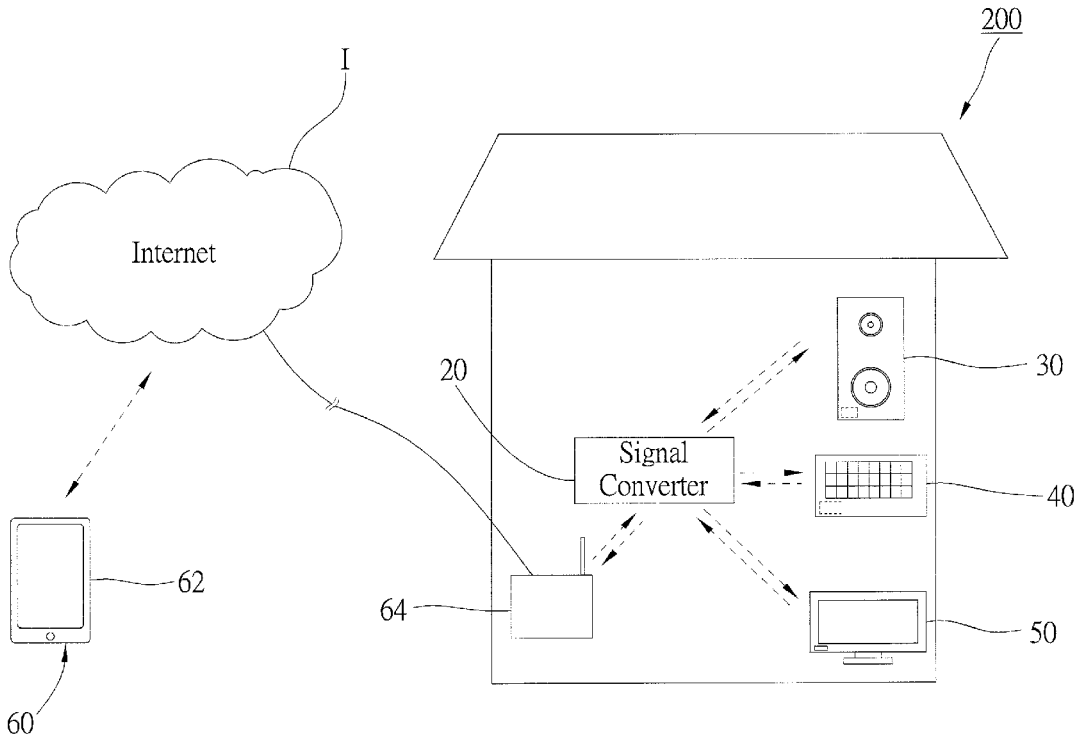
(57) **ABSTRACT**

A remote control system includes a control signal source, a signal converter, a first electric appliance, a second electric appliance, and a third electric appliance. The control signal source sends out WiFi signals which contain control commands. The signal converter converts the WiFi signals into Bluetooth signals, RF signals, or IR signals, wherein these signals are respectively transmitted to a Bluetooth transceiver, an RF transceiver, and an IR transmitter which are respectively installed in the electric appliances to operate the electric appliances.



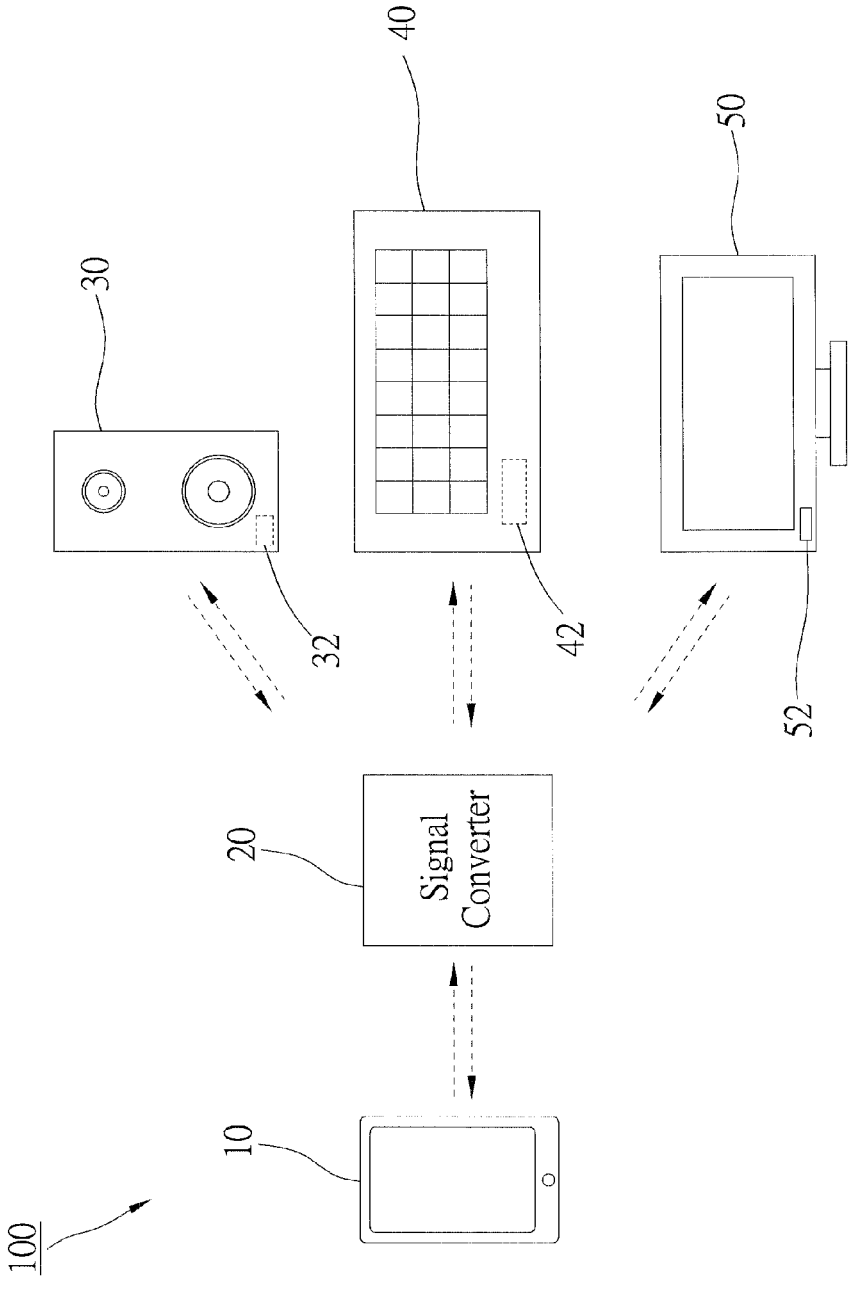


FIG. 1

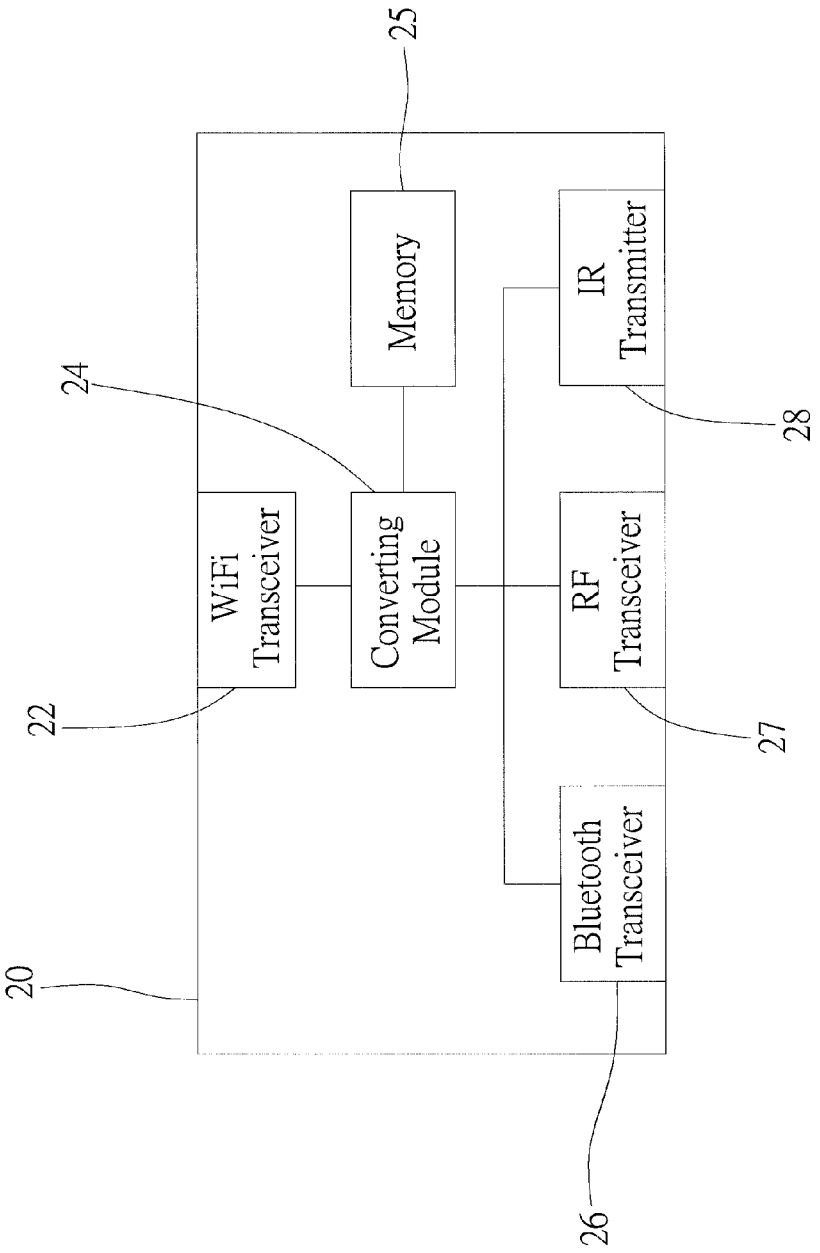

25
Memory
IR Transmitter
24
28
WiFi Transceiver
Converting Module
RF Transceiver
22
27
Bluetooth Transceiver
20
26

FIG. 2

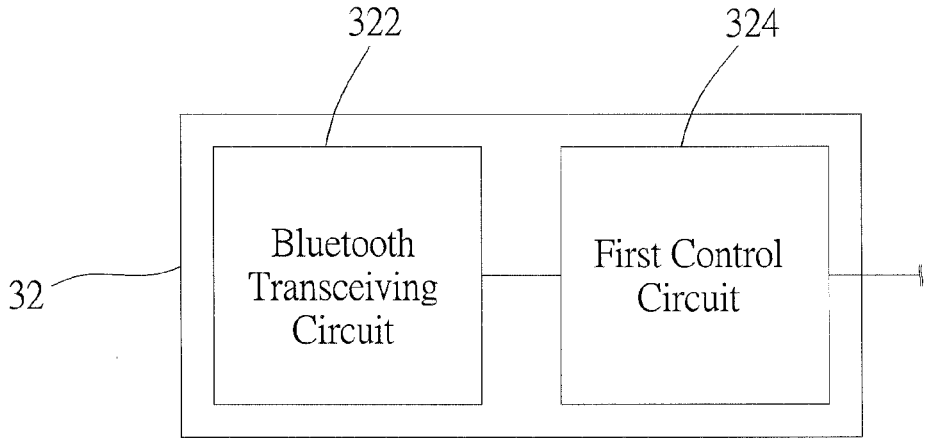


FIG. 3

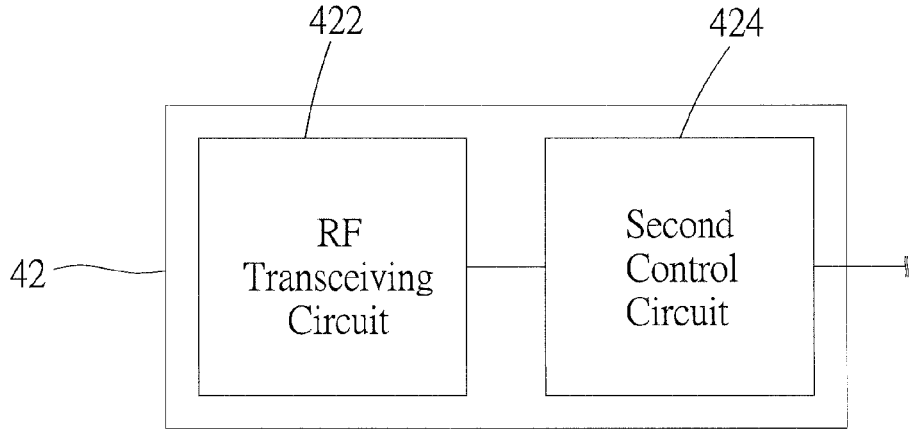


FIG. 4

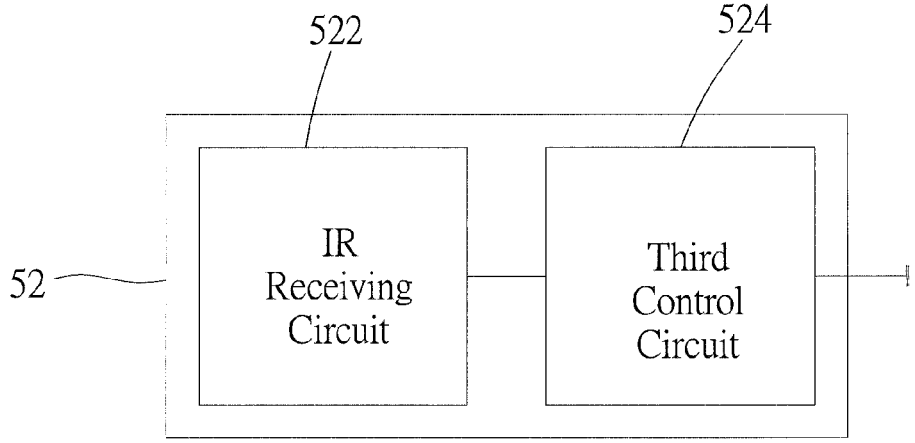


FIG. 5

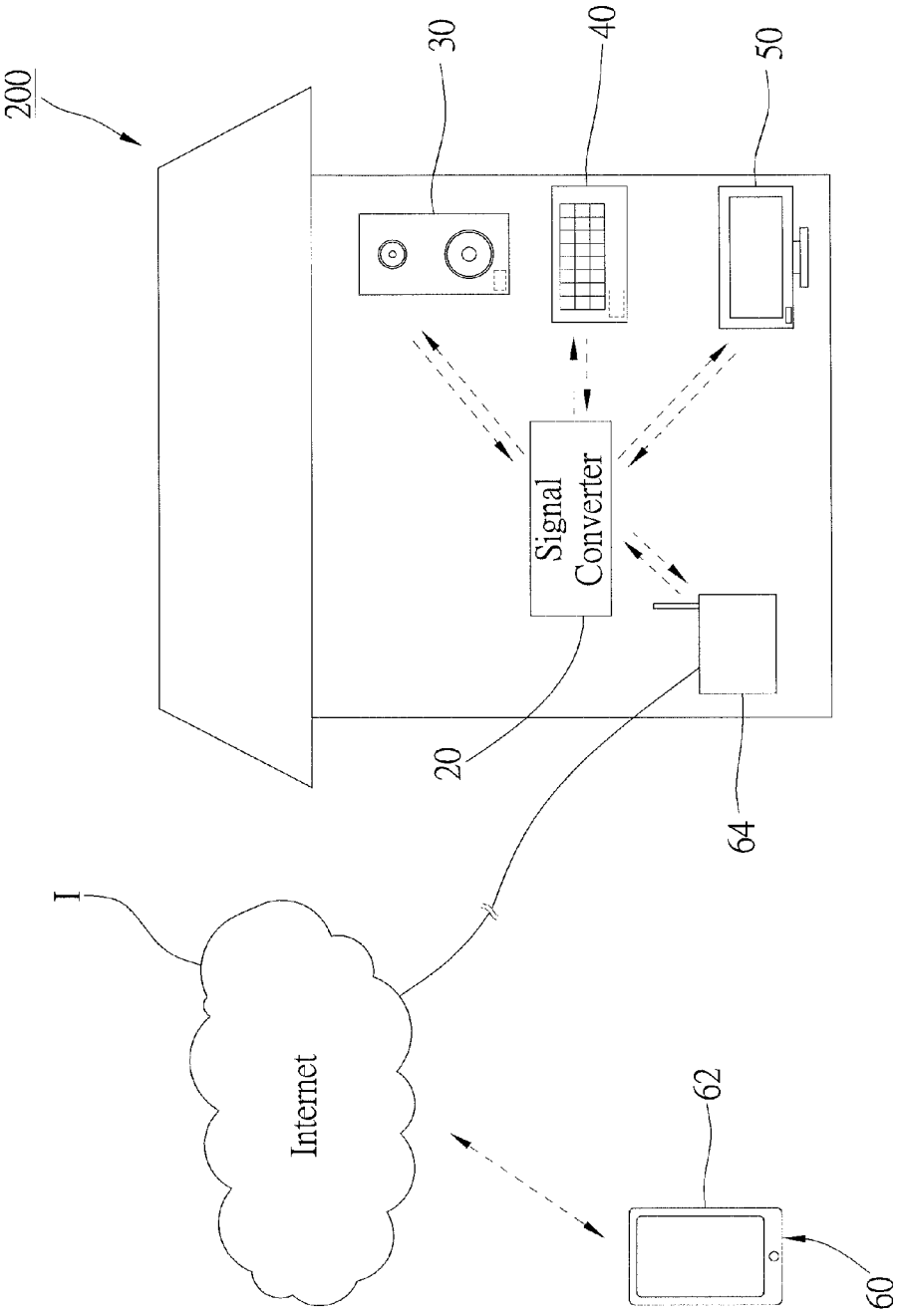


FIG. 6

REMOTE CONTROL SYSTEM AND SIGNAL CONVERTER OF THE SAME

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field

[0002] The present invention relates generally to remote control, and more particularly to a remote control system which has a converter capable of converting WiFi signals into Bluetooth signals.

[0003] 2. Description of Related Art

[0004] Bluetooth technology is commonly applied in electric appliances nowadays, whereby a user is able to control an electric appliance with an electronic device which has Bluetooth communication capability. More specifically, the conventional way to control wirelessly via Bluetooth communication technology includes providing a Bluetooth controller in an electric appliance, and sending Bluetooth signals which contain control commands to the Bluetooth controller with an electronic device (e.g., a smartphone). In this way, the electric appliance can be controlled accordingly. Obviously, it is convenient to control such electric appliances.

[0005] However, the coverage of Bluetooth communication is quite small; for example, an electric appliance located farther than 10 meters would not be able to be controlled via Bluetooth. What's more, Bluetooth signals would be greatly attenuated if an electric appliance and its corresponding electronic device are separated by a wall, and in such cases, the performance of controlling would be severely affected. Therefore, the usage of Bluetooth communication technology is still limited in the foregoing field.

BRIEF SUMMARY OF THE INVENTION

[0006] In view of the above, the primary objective of the present invention is to provide a remote control system, which is able to convert WiFi signals of wider coverage into Bluetooth signals to control electric appliances with a Bluetooth controller.

[0007] The present invention provides a remote control system, which includes a control signal source, a signal converter, and a first electric appliance. The control signal source generates and sends out WiFi signals. The signal converter includes a WiFi transceiver, a converting module electrically connected to the WiFi transceiver, and a Bluetooth transceiver electrically connected to the converting module, wherein the WiFi transceiver receives the WiFi signals from the control signal source, and the converting module converts the WiFi signals into corresponding Bluetooth signals to be sent out by the Bluetooth transceiver. The first electric appliance includes a Bluetooth transceiving circuit and a first control circuit electrically connected to the Bluetooth transceiving circuit, wherein the Bluetooth transceiving circuit receives the Bluetooth signals from the Bluetooth transceiver, and the first control circuit controls the first electric appliance to perform functions according to the received Bluetooth signals.

[0008] The present invention also provides a signal converter, which includes a WiFi signal transceiver, a converting module, and a Bluetooth transceiver. The WiFi signal transceiver receives WiFi signals. The converting module is electrically connected to the WiFi transceiver, wherein the converting module converts the WiFi signals into corresponding Bluetooth signals to be sent out. The Bluetooth transceiver is electrically connected to the converting module, wherein the Bluetooth transceiver transmits the Bluetooth signals to a first electric appliance.

[0009] With the remote control system and the signal converter, WiFi signals can be converted into Bluetooth signals first and then transmitted to a corresponding electric appliance which is located at a farther distance.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0010] The present invention will be best understood by referring to the following detailed description of some illustrative embodiments in conjunction with the accompanying drawings, in which

[0011] FIG. **1** is a schematic diagram of a first preferred embodiment of the present invention;

[0012] FIG. **2** is a block diagram of the signal converter of the first preferred embodiment of the present invention;

[0013] FIG. **3** is a block diagram of the Bluetooth controller of the first preferred embodiment of the present invention;

[0014] FIG. **4** is a block diagram of the RF controller of the first preferred embodiment of the present invention;

[0015] FIG. **5** is a block diagram of the IR controller of the first preferred embodiment of the present invention; and

[0016] FIG. **6** is a schematic diagram of a second preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0017] As shown in FIG. **1** to FIG. **5**, a remote control system **100** of the first preferred embodiment of the present invention includes a control signal source, a signal converter **20**, a first electric appliance, a second electric appliance, and a third electric appliance.

[0018] In the first preferred embodiment, the control signal source is a smartphone **10**, which is installed with an application for users to input control commands (e.g., turning on/off) to control the electric appliances, wherein the application encapsulates the inputted control commands into WiFi signals to be sent out. In practice, the control signal source can be, of course, a computer or other devices which are capable of sending out WiFi signals.

[0019] The first electric appliance is a stereo set **30**, the second electric appliance is an air conditioner **40**, and the third electric appliance is a TV **50**, wherein the stereo set **30** can be controlled via Bluetooth, while the air conditioner **40** and the TV **50** can be respectively controlled via RF (radio frequency) and IR (infrared) signals.

[0020] As shown in FIG. **2**, the signal converter **20** includes a WiFi transceiver **22**, a converting module **24**, a memory **25**, a Bluetooth transceiver **26**, an RF transceiver **27**, and an IR transmitter **28**.

[0021] The WiFi transceiver **22** receives WiFi signals sent from the smartphone **10**. The converting module **24** is electrically connected to the WiFi transceiver **22**, while the memory **25** is electrically connected to the converting module **24**, wherein the memory **25** is stored with a plurality of ID codes which respectively corresponds to each electric appliance. In addition, the memory **25** is also stored with a plurality of classification codes of signals, including Bluetooth, RF, IR, etc., which are receivable by each electric appliance.

[0022] The WiFi transceiver **22** transmits the received WiFi signals to the converting module **24**, wherein the converting module **24** reads data in the memory **25** as a reference, and the

WiFi signals are then accordingly converted into Bluetooth signals, RF signals, or IR signals to be sent out.

[0023] The Bluetooth transceiver **26**, the RF transceiver **27**, and the IR transmitter **28** are electrically connected to the converting module **24**, respectively, and they respectively transmit the Bluetooth signals, the RF signals, and the IR signals provided by the converting module **24** to the corresponding electric appliance.

[0024] As shown in FIG. **3**, the stereo set **30** is installed with a Bluetooth controller **32**, wherein the Bluetooth controller **32** includes a Bluetooth transceiving circuit **322** and a first control circuit **324**. The Bluetooth transceiving circuit **322** receives the Bluetooth signals transmitted from the Bluetooth transceiver **26**. The first control circuit **324** is electrically connected to the Bluetooth transceiving circuit **322** to control the stereo set **30** to perform certain functions according to the Bluetooth signals received by the Bluetooth transceiving circuit **322**.

[0025] As shown in FIG. **4**, the air conditioner **40** is installed with an RF controller **42**, wherein the RF controller **42** includes an RF transceiving circuit **422** and a second control circuit **424**. The RF transceiving circuit **422** receives the RF signals transmitted from the RF transceiver **27**. The second control circuit **424** is electrically connected to the RF transceiving circuit **422** to control the air conditioner **40** to perform certain functions according to the RF signals received by the RF transceiving circuit **422**.

[0026] As shown in FIG. **5**, the TV **50** is installed with an IR controller **52**, wherein the IR controller **52** includes an IR receiving circuit **522** and a third control circuit **524**. The IR receiving circuit **522** receives the IR signals transmitted from the IR transmitter **28**. The third control circuit **524** is electrically connected to the IR receiving circuit **522** to control the TV **50** to perform certain functions according to the IR signals received by the IR receiving circuit **522**.

[0027] To correspondingly convert the received WiFi signals which contain the control commands into the Bluetooth signals, the RF signals, or the IR signals with the signal converter **20**, the remote control system **100** is set up to control each of the electric appliances in the following way.

[0028] First, the Bluetooth transceiving circuit **322** of the stereo set **30** transmits the Bluetooth signals which contain all kinds of control information, such as turning on/off, and the corresponding ID code of the stereo set **30** to the Bluetooth transceiver **26** of the signal converter **20**. After receiving and recording the Bluetooth signals, the Bluetooth transceiver **26** stores the ID codes contained in the Bluetooth signals into the memory **25** through the converting module **24**.

[0029] After that, the converting module **24** stores the classification code of the received signals (i.e., Bluetooth signals) into the memory **25**, and establishes a connection between the classification code and the ID code contained in the received Bluetooth signals. Finally, the converting module **24** encapsulates the ID code and the control information into WiFi signals, which are then transmitted to the smartphone **10** through the WiFi transceiver **22**.

[0030] And then, all kinds of the control information of the stereo set **30**, such as turning on/off, are shown on a display of the smartphone **10** for a user to select therefrom. Once selected, the smartphone **10** encapsulates the corresponding control command and the ID code of the stereo set **30** into WiFi signals to be sent out. Furthermore, after the WiFi transceiver **22** receives the WiFi signals and then transfers to the converting module **24**, the converting module **24** extracts the classification code corresponding to the stereo set **30** in accordance to the ID code of the stereo set **30** contained in the WiFi signals, and then converts the control command into the corresponding Bluetooth signals. Based on the classification code, the Bluetooth transceiver **26** is switched on to transmit the control command to the electric appliance corresponding to the ID code (i.e., stereo set **30**), and the control process of the stereo set **30** is completed by the moment.

[0031] The way of setting up the air conditioner **40** is similar. In more details, the RF transceiving circuit **422** of the air conditioner **40** transmits the RF signals which contain all kinds of control information and the corresponding ID code of the air conditioner **40** to the RF transceiver **27** of the signal converter **20**, and the ID code contained in the RF signals is stored into the memory **25** through the converting module **24**, which also stores the classification code of the received signals (i.e., RF signals) into the memory **25**, and establishes a connection between the classification code and the ID code corresponding to the air conditioner **40**.

[0032] After that, the converting module **24** encapsulates the ID code and the control information into WiFi signals, which are then transmitted to the smartphone **10** through the WiFi transceiver **22**. In this way, all kinds of the control information of the air conditioner **40** are shown on the display of the smartphone **10** for a user to select therefrom. Similarly, the air conditioner **40** can be controlled wirelessly as described above relating to the stereo set **30**, except that the RF transceiver **27** is switched on instead in accordance to the classification code corresponding to the RF signals.

[0033] The method of setting up the TV **50** is basically the same with those of the aforementioned electric appliances **30**, **40**, except that the IR controller **52** is unable to send out IR signals. Therefore, the memory **25** is previously stored with a plurality of IR protocols and the classification code corresponding to the IR signals, wherein one of the IR protocols corresponds to the ID code and all kinds of control information of the TV **50**. A user can select the IR protocol corresponding to the TV **50** by transmitting WiFi signals which contain a selecting command to the signal converter **20** through the smartphone **10**. According to the selecting command, the converting module **24** extracts the IR protocol corresponding to the TV **50** from the memory **25**, and encapsulates the control information and the ID code of the TV **50** into WiFi signals, which are then transmitted to the smartphone **10** through the WiFi transceiver **22**.

[0034] After that, the display of the smartphone **10** shows all kinds of the control information of the TV **50** for a user to select therefrom. Once selected, the smartphone **10** transmits WiFi signals which contain the ID code and the related control command of the TV **50** to the signal converter **20**. According to the ID code of the TV **50** contained in the WiFi signals, the converting module **24** of the signal converter **20** then extracts the classification code and the IR protocol corresponding to the TV **50** from the memory **25**, and the control command is encapsulated into IR signals. Based on the classification code, the IR transmitter **28** is switched on to transmit the IR signals to the IR controller **52** to control the TV **50**.

[0035] In summary, the remote control system **100** of the present invention sends out the WiFi signals according to the control commands inputted via the smartphone **10**, and the signal converter **20** converts the WiFi signals into the Bluetooth signals, the RF signals, or the IR signals, which are then transmitted to each of the corresponding electric appliances. Whereby the electric appliances can be controlled at a remote

distance. In other words, the remote control system **100** of the present invention is not only able to convert the WiFi signals into the Bluetooth signals, but also into the RF signals or the IR signals to meet different requirements, which improves the convenience of controlling several kinds of electric appliance.

[0036] As shown in FIG. **6**, a remote control system **200** of the second preferred embodiment of the present invention is basically the same with the aforementioned first preferred embodiment, except that the control signal source **60** includes an electronic device, which is a smartphone **62** as an example, and a wireless access point (AP) **64**.

[0037] The smartphone **62** transmits signals which contain the control commands to the wireless AP **64** through an Internet I; the wireless access point **64** converts the signals into WiFi signals, and transmits the WiFi signals to the signal converter **20**. The aforementioned process of converting the WiFi signals into the Bluetooth signals, the RF signals, or the IR signals is then taking place. In this way, a user who is at an outdoor location can still control each of the electric appliances through the smartphone **62**, which greatly increases the communication distance between the electronic device and each of the electric appliances.

[0038] It must be pointed out that the embodiments described above are only some preferred embodiments of the present invention. All equivalent structures which employ the concepts disclosed in this specification and the appended claims should fall within the scope of the present invention.

What is claimed is:

1. A remote control system, comprising:

a control signal source which generates and sends out WiFi signals;

a signal converter including a WiFi transceiver, a converting module electrically connected to the WiFi transceiver, and a Bluetooth transceiver electrically connected to the converting module, wherein the WiFi transceiver receives the WiFi signals from the control signal source, and the converting module converts the WiFi signals into corresponding Bluetooth signals to be sent out by the Bluetooth transceiver; and

a first electric appliance including a Bluetooth transceiving circuit and a first control circuit electrically connected to the Bluetooth transceiving circuit, wherein the Bluetooth transceiving circuit receives the Bluetooth signals from the Bluetooth transceiver, and the first control circuit controls the first electric appliance to perform functions according to the received Bluetooth signals.

2. The remote control system of claim **1**, further comprising a second electric appliance, which includes an RF transceiving circuit and a second control circuit electrically connected to the RF transceiving circuit, wherein the signal converter includes an RF transceiver electrically connected to the converting module, which converts the WiFi signals received by the WiFi transceiver into corresponding RF signals to be sent out by the RF transceiver; the RF transceiving circuit of the second electric appliance receives the RF signals from the RF transceiver of the signal converter, and the second control circuit accordingly controls the second electric appliance to perform functions.

3. The remote control system of claim **2**, wherein the signal converter includes a memory, which is stored with ID codes respectively referring to the first electric appliance and the second electric appliance, and classification codes each representing different types of signals receivable by each of the electric appliances; the WiFi signals from the control signal source contain the ID code referring to one of the electric appliances; the converting module extracts the classification code from the memory which corresponds to the electric appliance referred by the ID code contained in the WiFi signals, and then switches on the Bluetooth transceiver or the RF transceiver according to the extracted classification code in order to transmit the corresponding Bluetooth signals or RF signals to the corresponding electric appliance.

4. The remote control system of claim **1**, further comprising a third electric appliance, which includes an IR receiving circuit and a third control circuit electrically connected to the IR receiving circuit, wherein the signal converter includes an IR transmitter electrically connected to the converting module, which converts the WiFi signals received by the WiFi transceiver into IR signals to be sent out by the IR transmitter; the IR receiving circuit of the third electric appliance receives the IR signals from the IR transmitter of the signal converter, and the third control circuit accordingly controls the third electric appliance to perform functions.

5. The remote control system of claim **4**, wherein the signal converter includes a memory, which is stored with ID codes respectively referring to the first electric appliance and the third electric appliance, and classification codes each representing different types of signals receivable by each of the electric appliances; the WiFi signals from the control signal source contain the ID code referring to one of the electric appliances; the converting module extracts the classification code from the memory which corresponds to the electric appliance referred by the ID code contained in the WiFi signals, and then switches on the Bluetooth transceiver or the IR transmitter according to the extracted classification code in order to transmit the corresponding Bluetooth signals or IR signals to the corresponding electric appliance.

6. The remote control system of claim **1**, wherein the control signal source includes an electronic device and a wireless access point which communicates with the electronic device; the electronic device transmits signals which contain control commands to the wireless access point, which then converts the signals into the WiFi signals, and sends out the WiFi signals.

7. A signal converter, comprising:

a WiFi transceiver receives WiFi signals;

a converting module electrically connected to the WiFi transceiver, wherein the converting module converts the WiFi signals into corresponding Bluetooth signals to be sent out; and

a Bluetooth transceiver electrically connected to the converting module, wherein the Bluetooth transceiver transmits the Bluetooth signals to a first electric appliance.

8. The signal converter of claim **7**, further comprising an RF transceiver electrically connected to the converting module, wherein the converting module converts the WiFi signals received by the WiFi transceiver into RF signals to be transmitted to a second electric appliance by the RF transceiver.

9. The signal converter of claim **7**, further comprising an IR transmitter electrically connected to the converting module, wherein the converting module converts the WiFi signals received by the WiFi transceiver into IR signals to be transmitted to a third electric appliance by the IR transmitter.

10. The signal converter of claim **8**, further comprising an IR transmitter electrically connected to the converting module, wherein the converting module converts the WiFi signals received by the WiFi transceiver into IR signals to be transmitted to a third electric appliance by the IR transmitter.

* * * * *