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(54) **WIRELESS SPEAKER SYSTEM**

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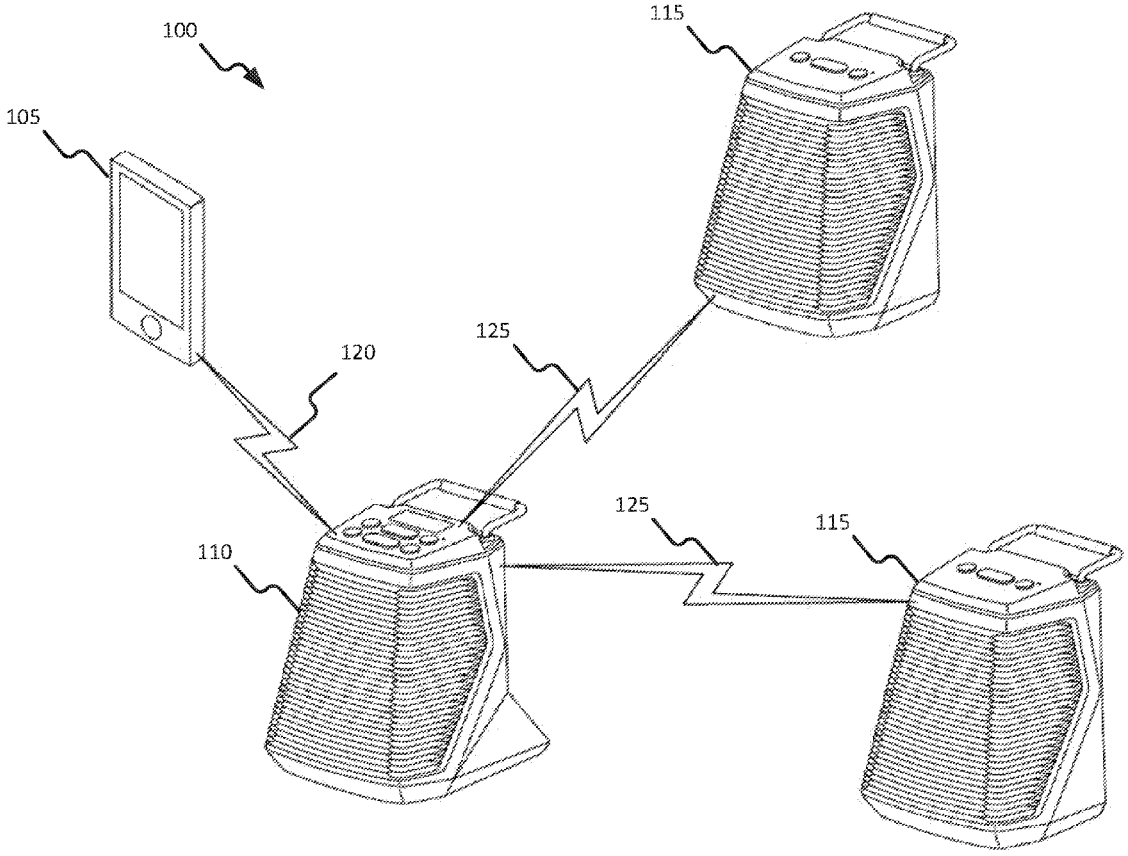
(52) **U.S. Cl.**

CPC ***H04R 3/12*** (2013.01); ***H04R 1/02*** (2013.01); *H04R 2420/07* (2013.01)

(57) **ABSTRACT**

A speaker system including a main speaker unit and a satellite speaker unit. The main speaker unit includes a battery receptacle configured to receive a battery pack. The main speaker unit is configured to receive an audio signal from a device using a first communications protocol and output the audio signal using a second communications protocol. The satellite speaker unit includes a satellite battery receptacle configured to receive a second battery pack. The satellite speaker unit is configured to receive the audio signal from the main speaker unit using the second communications protocol.



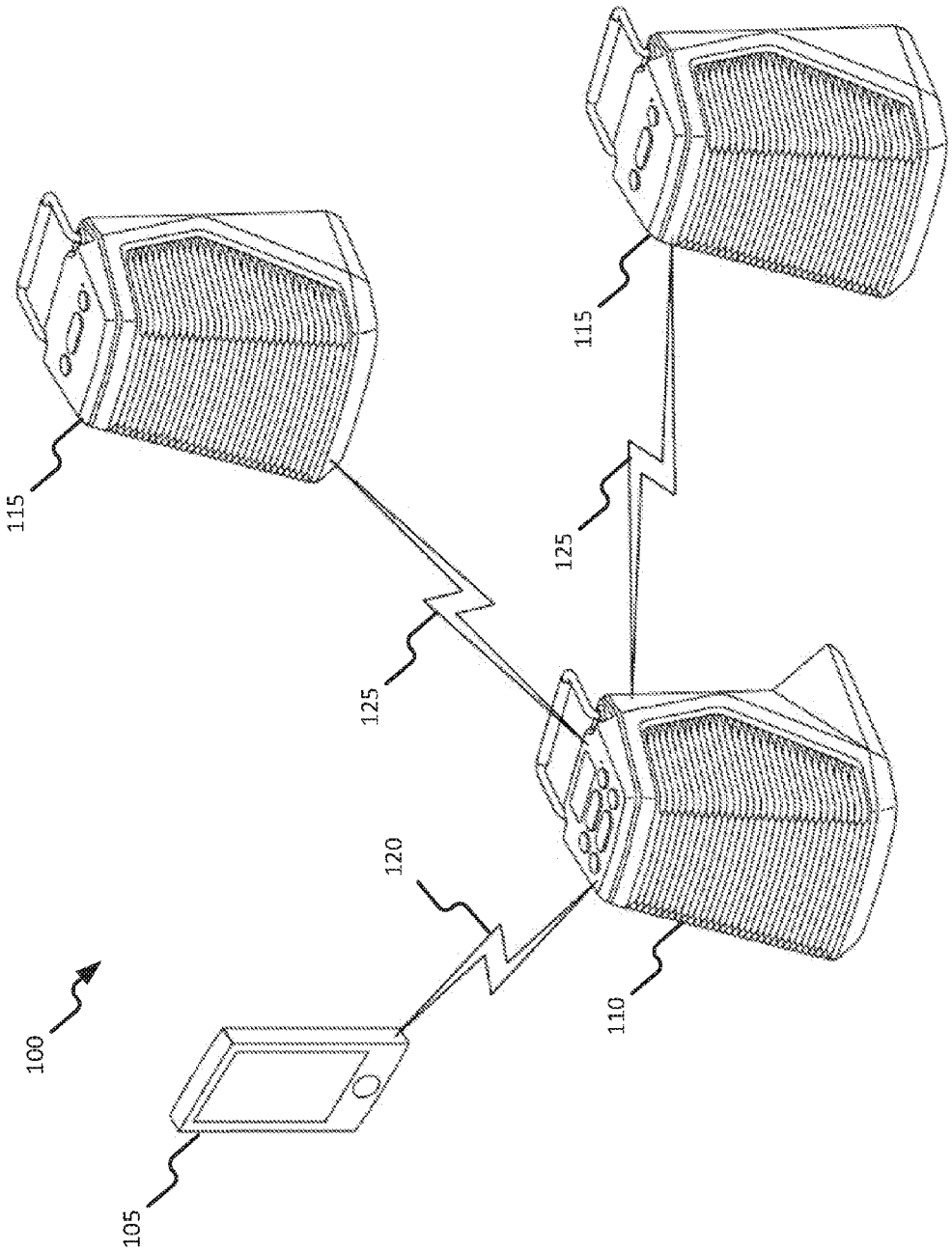


FIG. 1

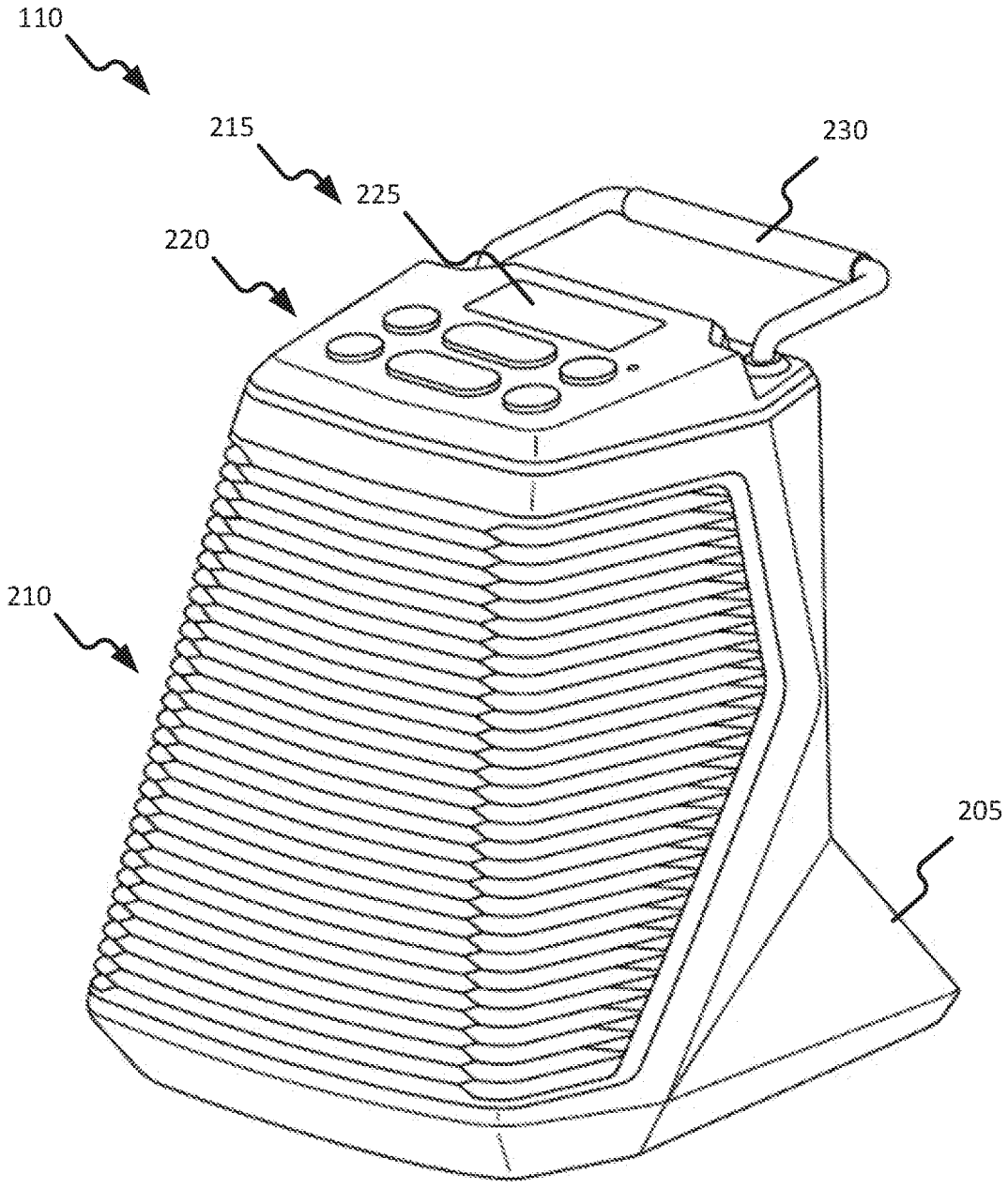


FIG. 2

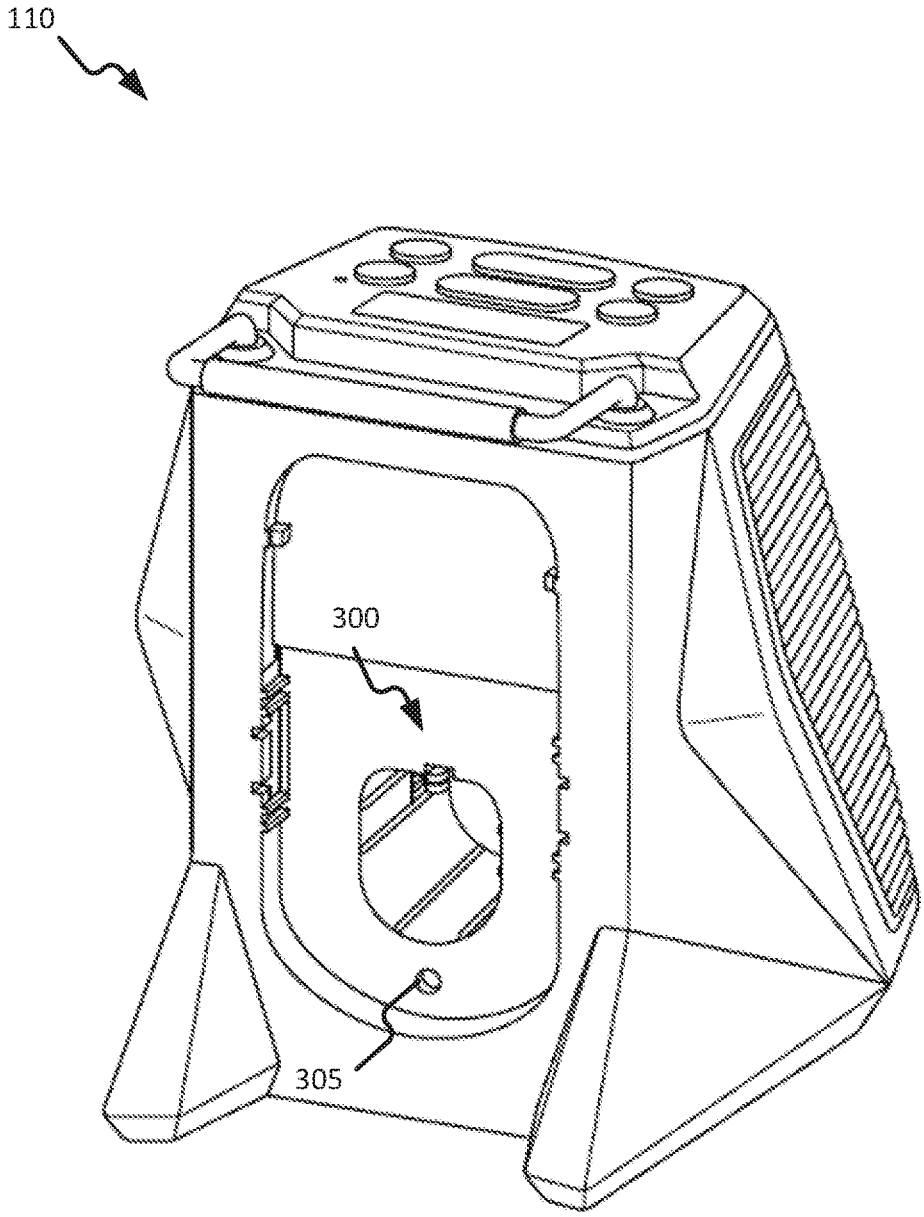


FIG. 3

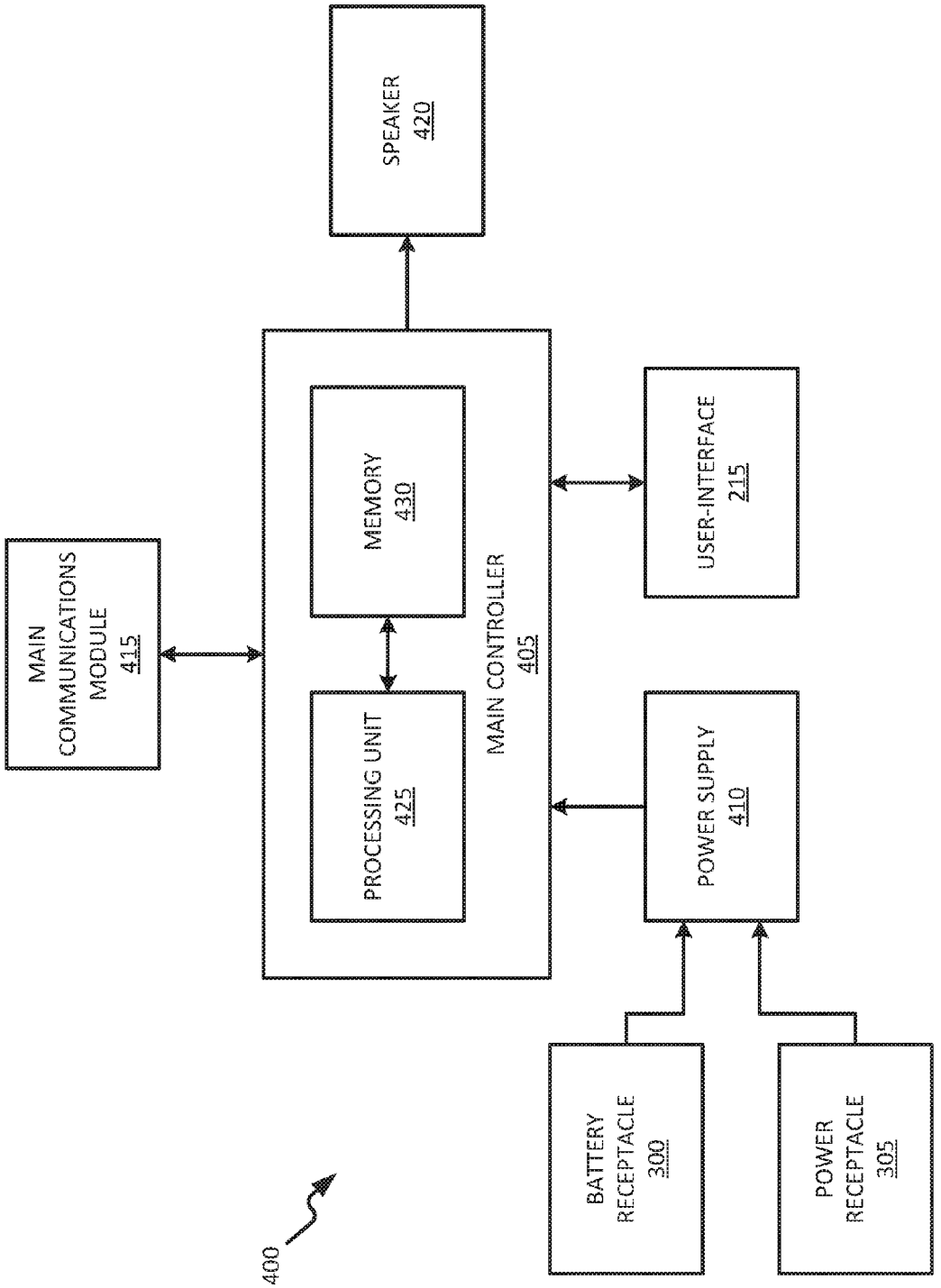

SPEAKER
420
MEMORY
430
MAIN CONTROLLER
405
USER-INTERFACE
215
MAIN
COMMUNICATIONS
MODULE
415
PROCESSING UNIT
425
POWER SUPPLY
410
BATTERY
RECEPTACLE
300
POWER
RECEPTACLE
305
400

FIG. 4

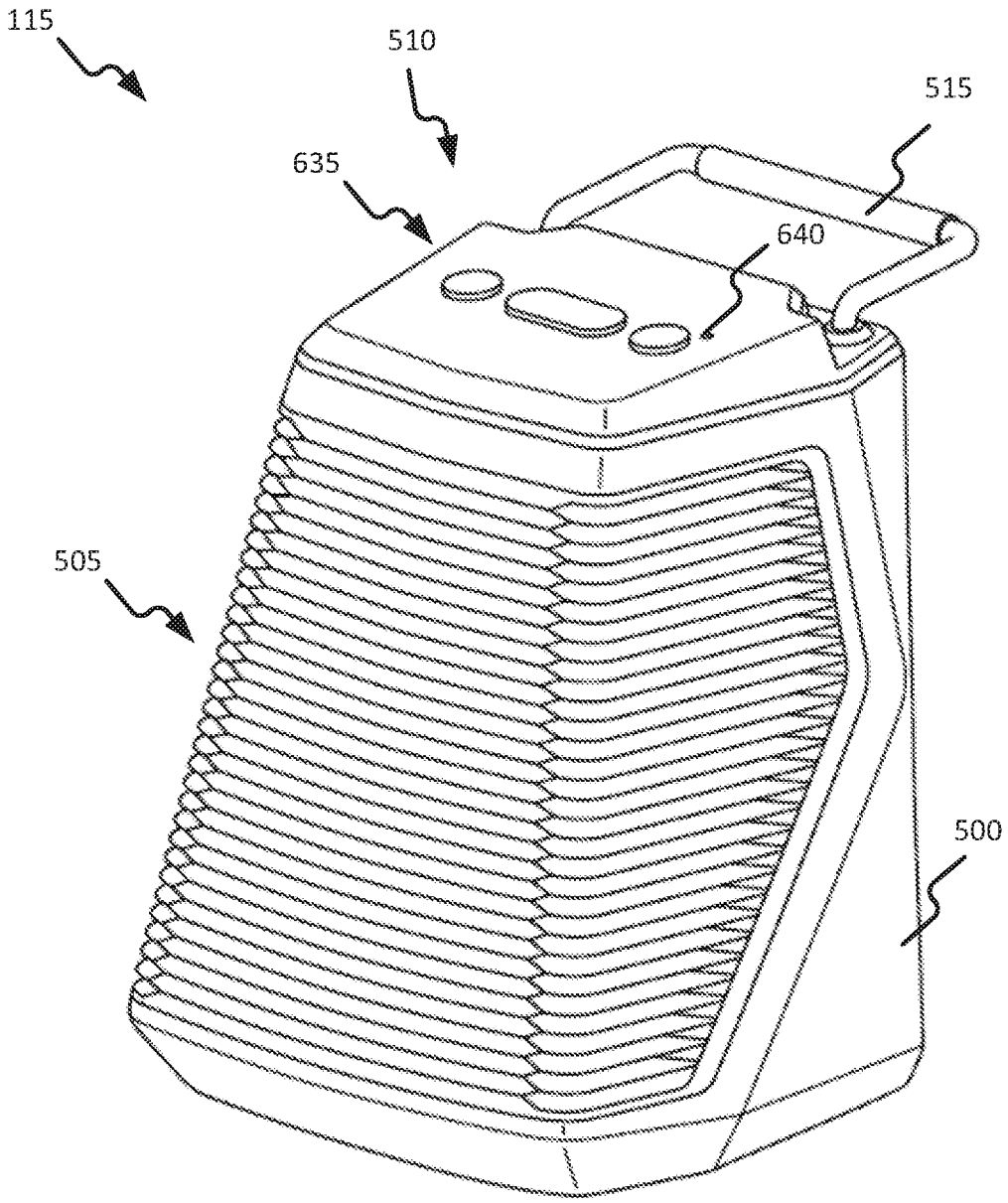


FIG. 5

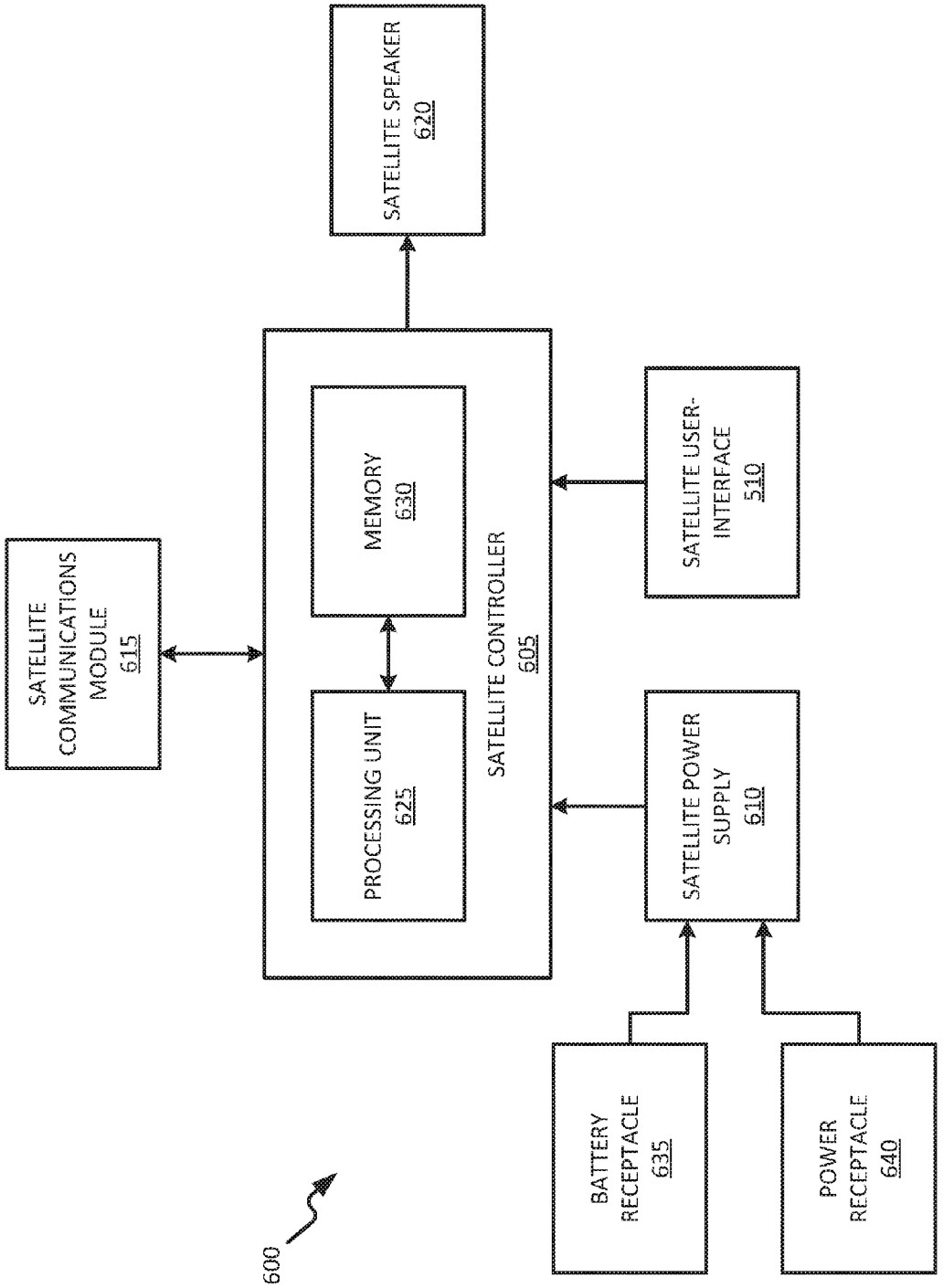

SATELLITE SPEAKER
620
SATELLITE CONTROLLER
605
MEMORY
630
PROCESSING UNIT
625
SATELLITE COMMUNICATIONS MODULE
615
SATELLITE USER-INTERFACE
510
SATELLITE POWER SUPPLY
610
BATTERY RECEPTACLE
635
POWER RECEPTACLE
640
600

FIG. 6

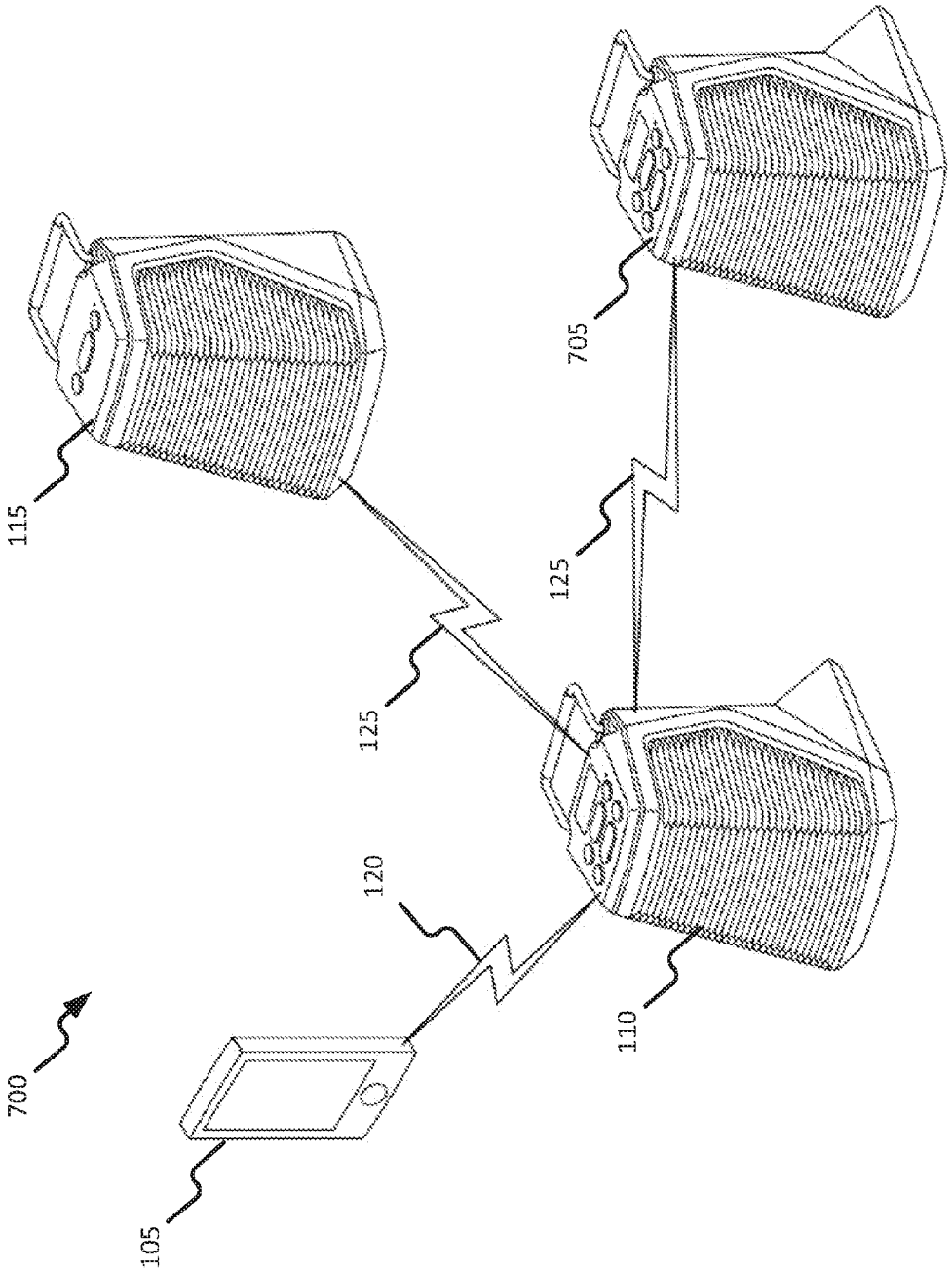


FIG. 7

WIRELESS SPEAKER SYSTEM

RELATED APPLICATIONS

[0001] The present application claims priority to U.S. Provisional Application No. 62/248,481, filed Oct. 30, 2015, the entire contents of which are hereby incorporated.

FIELD

[0002] The present application relates to speakers and speaker systems.

SUMMARY

[0003] Speaker systems may receive an audio signal from an external device and output audio, via a speaker device, corresponding to the received audio signal. Wired speaker systems may be limited to a single room or area, while wireless speaker systems may be limited to a single speaker unit located at a single location.

[0004] Thus, in one embodiment, the application provides a speaker system including a main speaker unit and a satellite speaker unit. The main speaker unit includes a battery receptacle configured to receive a battery pack. The main speaker unit is configured to receive an audio signal from a device using a first communications protocol and output the audio signal using a second communications protocol. The satellite speaker unit includes a satellite battery receptacle configured to receive a second battery pack. The satellite speaker unit is configured to receive the audio signal from the main speaker unit using the second communications protocol.

[0005] In another embodiment the application provides a speaker unit including a battery receptacle, a communications module, and a speaker. The battery receptacle is configured to receive a battery pack. The communications module is configured to receive an audio signal using a first communications protocol and output the audio signal using a second communications protocol. The speaker is configured to output sound corresponding to the audio signal.

[0006] Other aspects of the application will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** illustrates a speaker system according to some embodiments of the application.

[0008] FIG. **2** is a front perspective view of a main speaker unit of the speaker system of FIG. **1** according to some embodiments of the application.

[0009] FIG. **3** is a rear perspective view of the main speaker unit of FIG. **2** according to some embodiments of the application.

[0010] FIG. **4** is a block diagram of a main control system of the main speaker unit of FIGS. **2** & **3** according to some embodiments of the application.

[0011] FIG. **5** is a front perspective view of a satellite speaker unit of the speaker system of FIG. **1** according to some embodiments of the application.

[0012] FIG. **6** is a block diagram of a satellite control system of the satellite speaker unit of FIG. **5** according to some embodiments of the application.

[0013] FIG. **7** illustrates a speaker system according to another embodiment of the application.

DETAILED DESCRIPTION

[0014] Before any embodiments of the application are explained in detail, it is to be understood that the application is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The application is capable of other embodiments and of being practiced or of being carried out in various ways.

[0015] FIG. **1** illustrates a speaker system **100** according to some embodiments of the application. The speaker system **100** includes a device **105**, a main speaker unit **110**, and at least one satellite speaker unit **115**.

[0016] The device **105** may be a computing device including, but not limited to, a smart phone, a tablet, a laptop, and a computer. The device **105** may be configured to output an audio signal to the main speaker unit **110** via a first communications link **120**. The main speaker unit **110** may receive the audio signal and convert the audio signal to sound. The main speaker unit **110** may further output the audio signal to the one or more satellite speaker units **115** via a second communications link **125**. The one or more satellite speaker units **115** may then convert the audio signal to sound.

[0017] The first and second communications links **120**, **125** may employ one or more communications protocols. For example, the first and second communications links **120**, **125** may employ a Bluetooth protocol, a SKAA protocol, an Ad Hoc network (for example, ad hoc WiFi), a WiFi protocol, etc. In some embodiments, the first communications link **120** and the second communications link **125** are substantially similar. In another embodiments, the first communications link **120** and the second communications link **125** are different.

[0018] FIGS. **2** and **3** illustrate the main speaker unit **110** according to some embodiments of the application. The main speaker unit **110** includes a housing **205**. The housing **205** may be formed of plastic or a similar material. The housing **205** includes a speaker grill **210** configured to cover a main speaker **420** (FIG. **4**). The main speaker unit **110** further includes a main user-interface **215** including input devices **220** and a display **225**. In some embodiments, such as illustrated, the main speaker unit **110** further includes a handle **230** coupled to the housing **205**.

[0019] As illustrated in FIG. **3**, the housing **205** defines a battery receptacle **300**. The battery receptacle **300** is configured to receive a battery pack, such as but not limited to a power tool battery pack. The battery pack may include a battery pack housing containing one or more battery cells connected in a series-type and/or parallel-type configuration. In some embodiments, the battery cells may have a lithium-ion chemistry. The battery pack housing may further include a battery pack interface configured to physically couple to the battery receptacle **300**.

[0020] The battery receptacle **300** may further include power receptacle **305**. The power receptacle **305** may receive a line voltage, for example an alternating-current (AC) line voltage or direct-current (DC) line voltage.

[0021] FIG. **4** is a block diagram of a main control system **400** of the main speaker unit **110** according to some embodiments of the application. The main control system **400** includes a main controller **405** electrically and/or communicatively coupled to a power supply **410**, a main communications module **415**, the main speaker **420**, and the user-interface **215**. The main controller **405** includes a plurality of

electrical and electronic components that provide power, operational control, and protection to the components and modules within the main controller **405** and/or the main speaker unit **110**. For example, the controller **405** includes, among other things, a main processing unit **425** (e.g., a microprocessor, a microcontroller, or another suitable programmable device) and a main memory **430**. In some embodiments, the controller **405** is implemented partially or entirely on a printed circuit board or a semiconductor (e.g., a field-programmable gate array ["FPGA"] semiconductor) chip, such as a chip developed through a register transfer level ("RTL") design process.

[0022] The power supply **410** supplies a nominal voltage to the controller **405**. The power supply **410** is configured to receive power from a battery pack coupled to the battery receptacle **300** or the power receptacle **305**. The power supply **410** converts power received from the battery pack or power receptacle **305** into the nominal voltage.

[0023] The main communications module **415** provides communications links (for example, first communications link **120**, second communications link **125**, etc.) between the main speaker unit **110** and external devices (for example, device **105**, satellite speaker unit **115**, another main speaker unit, etc.). The communications links provided by the communications module **415** may be wired communications links, wireless communications links or a combination of wired and wireless communications links. The main communications module **415** may include a port (for example, an auxiliary port, a universal serial bus (USB) port, etc.) for providing the wired communications link. The main communications module **415** may further include a main transmitter and a main receiver, or a main transceiver for providing the wireless communications links.

[0024] The communications module **415** employs one or more communications protocols, such as but not limited to, a Bluetooth protocol, a SKAA protocol, an Ad Hoc network (for example, ad hoc WiFi), and a WiFi protocol. In some embodiments, the communications links provided by the communications module **415** may use a network, for example, a wide area network (WAN), a local area network (LAN), or a personal area network (PAN).

[0025] The main speaker **420** is configured to convert the audio signal into a corresponding sound. The main speaker **420** may be any electroacoustic transducer or transducers that produces sound in response to the received audio signal. Although illustrated as a single speaker, the main speaker **420** may include one or more speaker components, such as but not limited to, one or more drivers, one or more woofers, and one or more tweeters.

[0026] The main user-interface **215** is used to control or monitor the main speaker unit **110**. For example, the main user-interface **215** is operably coupled to the main controller **405** to control main power, volume, track changes, and connectivity of the main speaker unit **110**. The main user-interface **215** includes a combination of digital and analog input or output devices required to achieve a desired level of control and monitoring of the main speaker unit **110**. For example, the main user-interface **215** includes display **225** (e.g., a primary display, a secondary display, etc.) and input device **220** such as touch-screen displays, a plurality of knobs, dials, switches, buttons, etc. The display is, for example, a liquid crystal display (LCD), a light-emitting diode (LED) display, an organic LED (OLED) display, an electroluminescent display (ELD), a surface-conduction electron-emitter display (SED), a field emission display (FED), a thin-film transistor (TFT) LCD, etc.

[0027] FIG. **5** illustrates a front perspective view of the satellite speaker unit **115**. The satellite speaker unit **115** includes a satellite speaker housing **500**. Similar to the main speaker housing **205**, the satellite speaker housing **500** may be formed of plastic or a similar material. The satellite speaker housing **500** includes a satellite speaker grill **505** covering a satellite speaker **620** (FIG. **6**). The satellite speaker unit **115** further includes a satellite user-interface **510** and a handle **515** coupled to the housing **500**. In some embodiments, the satellite speaker unit **115** further includes a battery receptacle similar to battery receptacle **300** and/or a power receptacle similar to power receptacle **305**, of the main speaker unit **110**.

[0028] FIG. **6** is a block diagram of a satellite control system **600** of the satellite speaker unit **115**. The satellite control system **600** includes a satellite controller **605** electrically and/or communicatively coupled to a satellite power supply **610**, a satellite communications module **615**, the satellite speaker **620**, and the satellite user-interface **510**. Similar to the main controller **405**, the satellite controller **605** includes a plurality of electrical and electronic components that provide power, operational control, and protection to the components and modules within the satellite controller **605** and/or the satellite speaker unit **115**, for example but not limited to, a processing unit **625** and a memory **630**. In some embodiments, processing unit **625** and memory **630** are substantially similar to processing unit **425** and memory **430** of the main speaker unit **110**.

[0029] The satellite power supply **610** supplies a nominal voltage to the satellite controller **605**, as well as to other electrical components of the satellite speaker unit **115**. The satellite power supply **610** is configured to receive power from a battery pack coupled to a satellite battery receptacle **635** or a satellite power receptacle **640**. In some embodiments, the satellite battery receptacle **635** the satellite power receptacle **640** are substantially similar to the battery receptacle **300** and the power receptacle **305** of the main speaker unit **110**. The satellite power supply **610** converts power received from the battery pack **635** or power receptacle **640** into the nominal voltage.

[0030] The satellite communications module **615** is configured to receive the audio signal from the main communications module **415** via the second communications link **125**. The satellite communications module **615** may include a satellite transmitter and a satellite receiver, or a satellite transceiver for providing the second communications link **125**. The satellite communications module **615** employs one or more communications protocols, such as but not limited to, a Bluetooth protocol, a SKAA protocol, an Ad Hoc network (for example, ad hoc WiFi), and a WiFi protocol. In some embodiments, the communications links provided by the communications module **415** may use a network, for example, a wide area network (WAN), a local area network (LAN), or a personal area network (PAN).

[0031] The satellite speaker **620** is configured to convert the audio signal into a corresponding sound. The satellite speaker **620** may be any electroacoustic transducer or transducers that produces sound in response to the received audio signal. Although illustrated as a single speaker, the satellite speaker **620** may include one or more speaker components, such as but not limited to, one or more drivers, one or more woofers, and one or more tweeters.

[0032] The satellite user-interface **510** is used to control or monitor the main speaker unit **110**. For example, the satellite user-interface **510** is operably coupled to the main controller **405** to control main power, volume, track changes, and connectivity of the main speaker unit **110**. The satellite user-interface **510** includes a combination of digital and analog input or output devices required to achieve a desired level of control and monitoring of the main speaker unit **110**. For example, in the illustrated embodiment, the satellite user-interface **510** includes input device **635** (for example, a plurality of knobs, dials, switches, buttons, etc.) and an indicator **640** (for example, a light-emitting diode (LED)). In other embodiments, the satellite user-interface **510** further includes a display (e.g., a liquid crystal display (LCD), a LED display, an organic LED (OLED) display, an electroluminescent display (ELD), a surface-conduction electron-emitter display (SED), a field emission display (FED), a thin-film transistor (TFT) LCD, etc.).

[0033] FIG. **7** illustrates a speaker system **700** according to some embodiments of the application. In the illustrated embodiment, speaker system **700** includes the device **105**, the main speaker unit **110**, the satellite speaker unit **115**, and a second main speaker unit **705**. In such an embodiment, the device **105** outputs an audio signal to the main speaker unit **110** via a first communications link **120**. The main speaker unit **110** may receive the audio signal and convert the audio signal to sound. The main speaker unit **110** may further output the audio signal to the satellite speaker unit **115** via a second communications link **125**, as well as to the second main speaker unit **705**, via a second communications link **125**. The satellite speaker unit **115** and the second main speaker unit **705** may then convert the audio signal to sound. In such an embodiment, the second main speaker unit **705** may be substantially similar to the main speaker unit **110**. Although substantially similar to the main speaker unit **110**, in such an embodiment, the second main speaker unit **705** may act substantially similar to a satellite speaker unit **115**.

[0034] The first and second communications links **120**, **125** may employ one or more communications protocols. For example, the first and second communications links **120**, **125** may employ a Bluetooth protocol, a SKAA protocol, an Ad Hoc network (for example, ad hoc WiFi), a WiFi protocol, etc. In some embodiments, the first communications link **120** and the second communications link **125** are substantially similar. In another embodiments, the first communications link **120** and the second communications link **125** are different.

[0035] In some embodiments, the main speaker unit **110** may further include an AM/FM tuner. In such an embodiment, the main speaker unit **110** may receive the AM/FM signal, via the AM/FM tuner, and convert the AM/FM signal to sound. The main speaker unit **110** may further output the AM/FM signal to one or more satellite speaker units **115** via a second communications link **125**. The one or more satellite speaker units **115** may then convert the audio signal to sound.

[0036] Thus, the application provides, among other things, a speaker system. Various features and advantages of the application are set forth in the following claims.

What is claimed is:

1. A speaker system comprising:

a main speaker unit including a battery receptacle configured to receive a battery pack, the main speaker unit configured to

receive an audio signal from a device using a first communications protocol, and

output the audio signal using a second communications protocol; and

a satellite speaker unit including a satellite battery receptacle configured to receive a second battery pack, the satellite speaker unit configured to receive the audio signal from the main speaker unit using the second communications protocol.

2. The speaker system of claim **1**, wherein the first communications protocol is the same as the second communications protocol.

3. The speaker system of claim **1**, wherein the first communication protocol is a Bluetooth communications protocol.

4. The speaker system of claim **1**, wherein the second communications protocol is a SKAA communications protocol.

5. The speaker system of claim **1**, further comprising a second satellite speaker unit configured to receive the audio signal from the main speaker unit using the second communications protocol.

6. The speaker system of claim **1**, wherein the main speaker unit further includes a speaker configured to output sound corresponding to the audio signal.

7. The speaker system of claim **1**, wherein the satellite speaker unit further includes a satellite speaker configured to output sound corresponding to the audio signal.

8. The speaker system of claim **1**, wherein the main speaker unit includes a power receptacle configured to receive AC power.

9. The speaker system of claim **8**, wherein the power receptacle is located within the battery receptacle.

10. A speaker unit comprising:

a battery receptacle configured to receive a battery pack;

a communications module configured to receive an audio signal using a first communications protocol and output the audio signal using a second communications protocol; and

a speaker configured to output sound corresponding to the audio signal.

11. The speaker unit of claim **10**, wherein the audio signal is received from a device.

12. The speaker unit of claim **10**, wherein the audio signal is output to a satellite speaker unit.

13. The speaker unit of claim **12**, wherein the satellite speaker unit includes a satellite speaker configured to output sound corresponding to the audio signal.

14. The speaker unit of claim **13**, wherein the satellite speaker unit includes a satellite battery receptacle configured to receive a second battery pack.

15. The speaker unit of claim **10**, wherein the first communications protocol is the same as the second communications protocol.

16. The speaker unit of claim **10**, wherein the first communications protocol is a Bluetooth communications protocol.

17. The speaker unit of claim **10**, wherein the second communications protocol is a SKAA communications protocol.

18. The speaker unit of claim **10**, further comprising power receptacle configured to receive AC power.

19. The speaker system of claim **18**, wherein the power receptacle is located within the battery receptacle.

* * * * *