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(54) **SYSTEM AND METHOD FOR GENERATING A MAP OF A LINE ARRAY OF LOUDSPEAKERS ASSEMBLIES**

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***H04R 1/32*** (2006.01)
(Continued)

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CPC ..... ***H04S 7/40*** (2013.01); ***H04R 1/323*** (2013.01); *H04R 2201/403* (2013.01); *H04R 2430/20* (2013.01); *H04S 2400/11* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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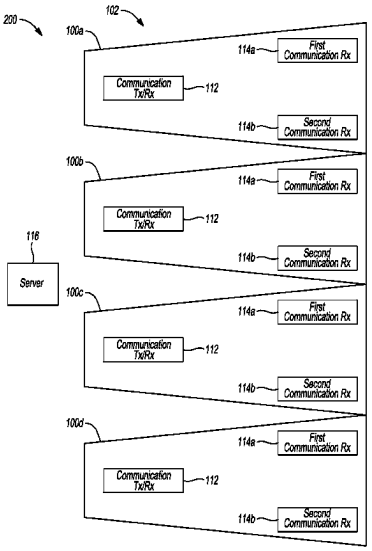
(57) **ABSTRACT**

In at least one embodiment, a system for generating a location map for a plurality of loudspeakers assemblies in a line array is provided. The system includes a first loudspeaker assembly that includes at least one controller. The at least one controller is programmed to receive a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array. The first unique identifier is indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly. The at least one controller is further programmed to generate a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly and to transmit the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

**20 Claims, 4 Drawing Sheets**



(51) **Int. Cl.**
***H04R 5/04*** (2006.01)
***H04R 29/00*** (2006.01)

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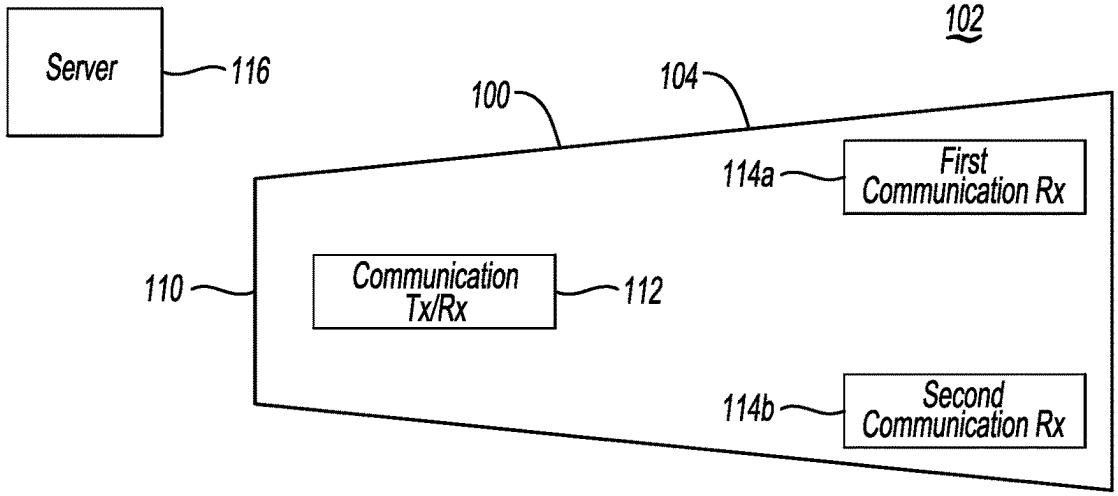
Server
116
102
100
104
114a
First Communication Rx
110
Communication Tx/Rx
112
114b
Second Communication Rx

Fig-1

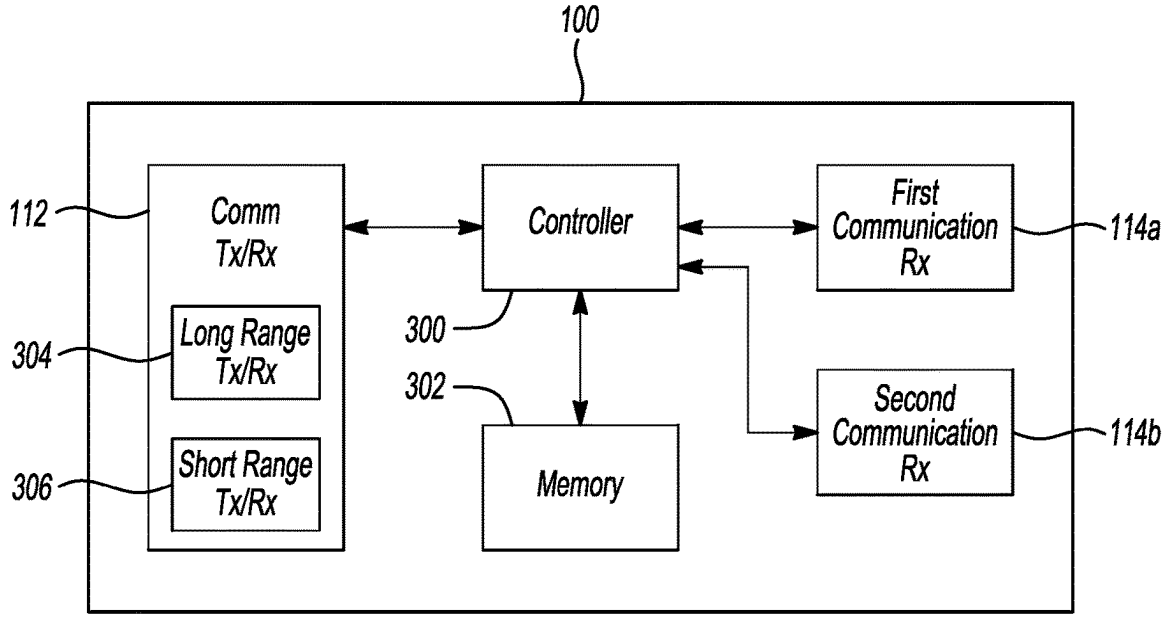
100
112
Comm Tx/Rx
Long Range Tx/Rx
304
Short Range Tx/Rx
306
Controller
300
302
Memory
First Communication Rx
114a
Second Communication Rx
114b

Fig-3

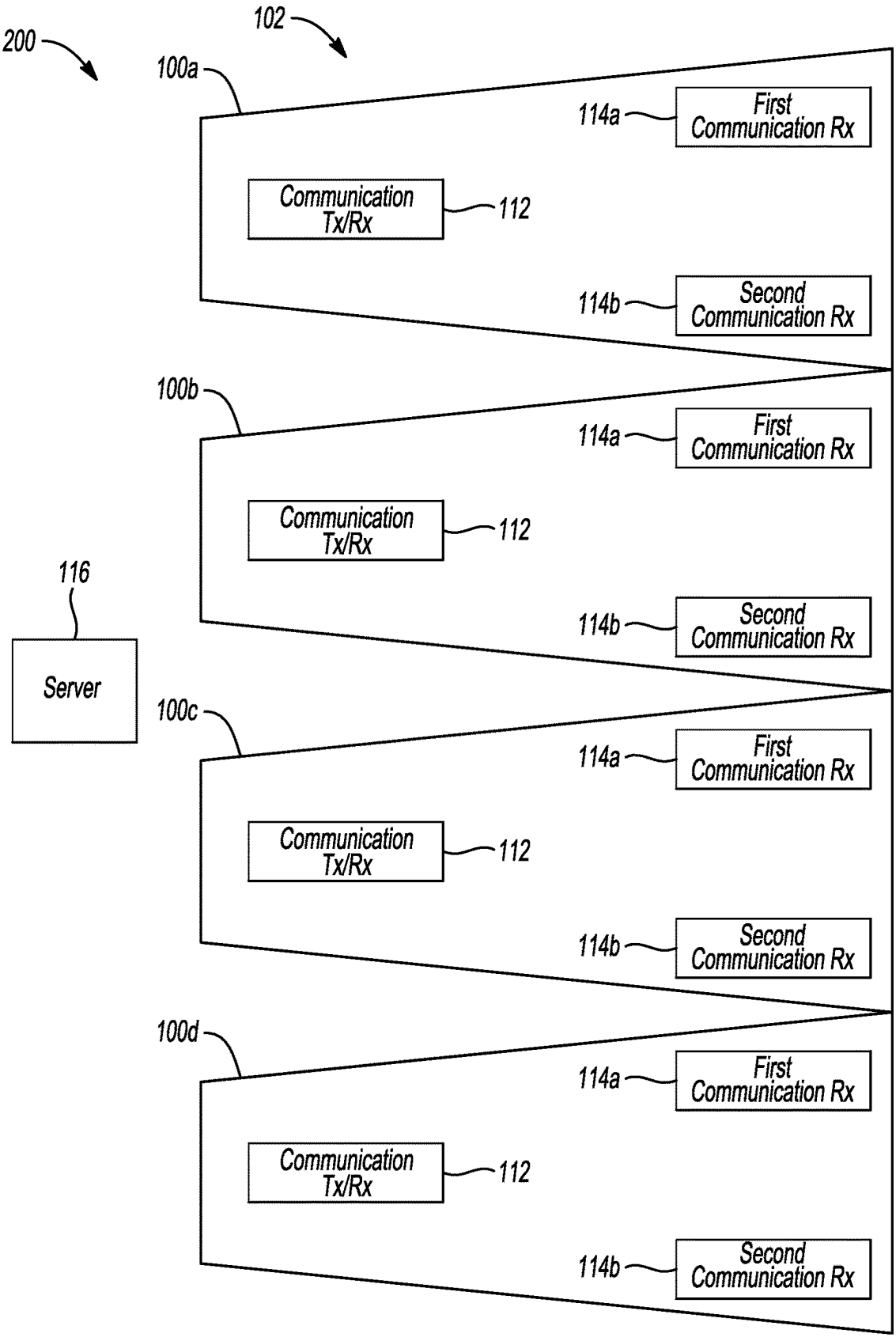
200
102
100a
114a
First Communication Rx
Communication Tx/Rx
112
114b
Second Communication Rx
100b
114a
First Communication Rx
Communication Tx/Rx
112
116
Server
114b
Second Communication Rx
100c
114a
First Communication Rx
Communication Tx/Rx
112
114b
Second Communication Rx
100d
114a
First Communication Rx
Communication Tx/Rx
112
114b
Second Communication Rx

Fig-2

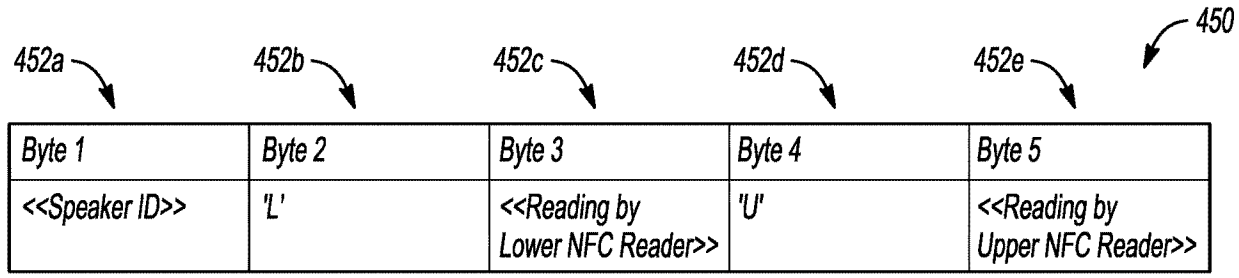


Fig-4

450
460
452a
452b
452c
452d
452e

| Loudspeaker Assembly | Byte 1 | Byte 2 | Byte 3 | Byte 4 | Byte 5 |
|---|---|---|---|---|---|
| 100a (Unique Identifier = 01) | 01 | L | FD | U | *FF |
| 100b (Unique Identifier = FD) | FD | L | FC | U | 01 |
| 100c (Unique Identifier = FC) | FC | L | FE | U | FD |
| 100d (Unique Identifier = FE) | FE | L | FF* | U | FC |

*-Denotes the Predefined Symbol "FF" to Indicate that the Loudspeaker Assembly 100a is Unable to Receive the Unique Identifier from a Loudspeaker Assembly Positioned Above the Loudspeaker Assembly 100a or to Indicate that the Loudspeaker Assembly 100d is Unable to Receive the Unique Identifier from a Loudspeaker Assembly Positioned Below the Loudspeaker Assembly 100d

Fig-5

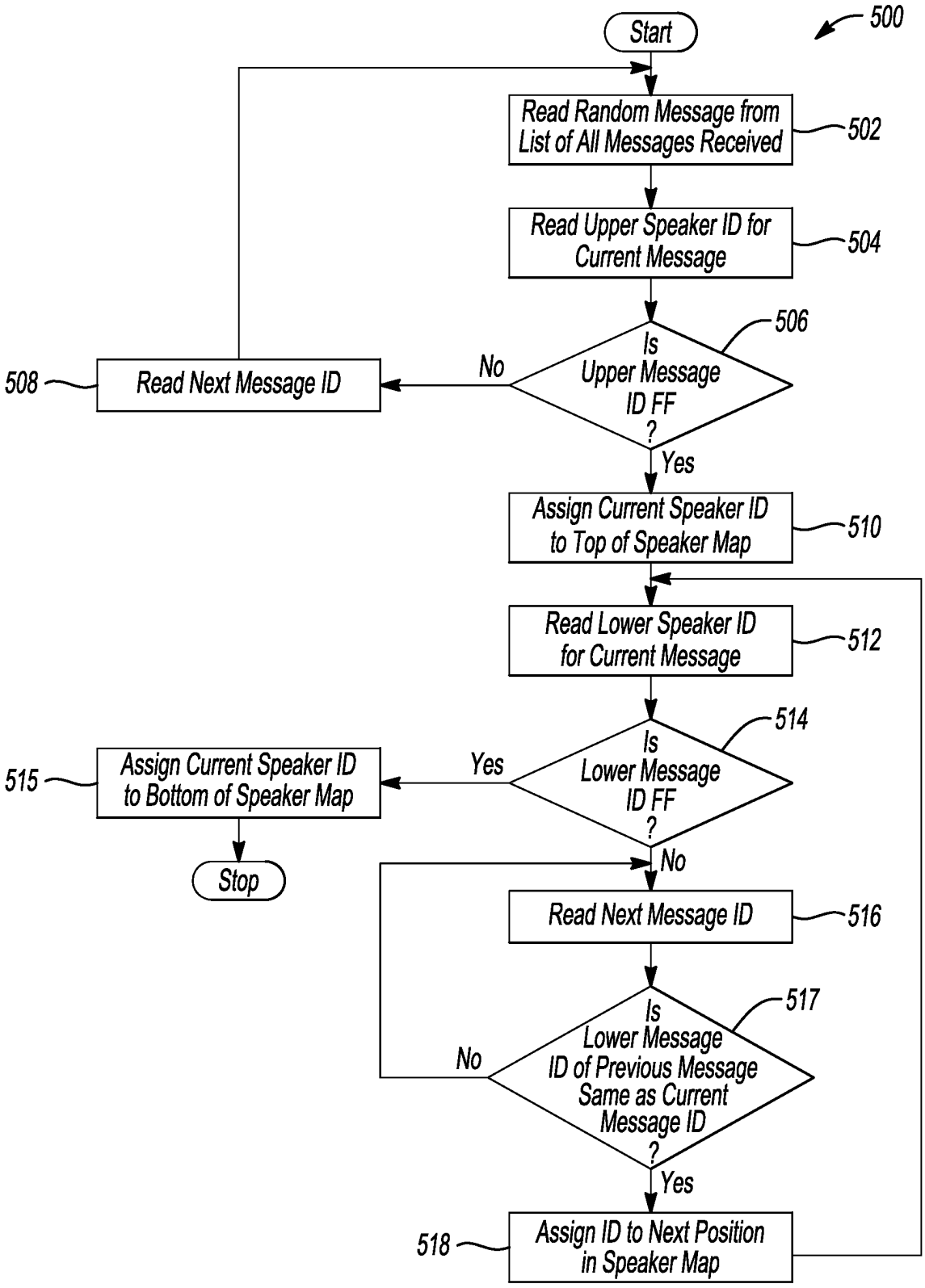
500
Start
Read Random Message from List of All Messages Received
502
Read Upper Speaker ID for Current Message
504
Is Upper Message ID FF ?
506
No
508
Read Next Message ID
Yes
Assign Current Speaker ID to Top of Speaker Map
510
Read Lower Speaker ID for Current Message
512
Is Lower Message ID FF ?
514
Yes
515
Assign Current Speaker ID to Bottom of Speaker Map
Stop
No
Read Next Message ID
516
Is Lower Message ID of Previous Message Same as Current Message ID ?
517
No
Yes
518
Assign ID to Next Position in Speaker Map

Fig-6

# SYSTEM AND METHOD FOR GENERATING A MAP OF A LINE ARRAY OF LOUDSPEAKERS ASSEMBLIES

## CROSS-REFERENCE TO RELATED APPLICATION

This application is the U.S. national phase of PCT Application No. PCT/US2020/058962 filed on Nov. 4, 2020, the disclosure of which is incorporated in its entirety by reference herein.

## TECHNICAL FIELD

Aspects disclosed herein generally relate to a system and method for generating a map of a line array of loudspeakers assemblies. In one aspect, one or more communication tags (or communication receivers) may be positioned at a top and at a bottom of each loudspeaker assembly in a line array. Additionally, each loudspeaker assembly may include a communication transmitter. Each loudspeaker assembly may be assigned a unique identifier. Each communication tag may transmit the unique identifier to an adjacent loudspeaker assembly. Each communication transmitter may also transmit a message to a server or controller (or central hub) that include the unique identifier for the loudspeaker assembly in addition to the unique identifier for adjacent loudspeaker assemblies. The server may collate all of the received messages to generate a map of the unique identifiers that is sorted based on their position. These aspects and others will be discussed in more detail below.

## BACKGROUND

Line array loudspeakers are a staple nowadays in large music concerts, stadiums, and auditoriums. Such loudspeakers are not only scalable, but also provide excellent audio quality and flexibility. However, line array speakers may come with their own unique set of challenges that is not present with traditional speakers like mid/low-frequency energy build-up and adjustment for speaker weight, etc. However, several problems remain unresolved with the loudspeakers of a line array. For example, it may be difficult to identify the position or location of the loudspeakers in the array.

Generally, the assembly of the loudspeakers in the array is performed at the venue. Once the loudspeakers are assembled and placed into position within the array, it may be challenging to access loudspeakers. The placement of the speakers is usually performed at great heights in the venue. Often times, it is often not feasible to work on or to service these loudspeakers during a live concert or performance. Various implementations used to determine the location of a loudspeaker in the array involve measuring an amount of current that flows through each loudspeaker. However, a number of these solutions are complex, and the amount of engineering time spent on implementing these methodologies is not feasible.

## SUMMARY

In at least one embodiment, a system for generating a location map for a plurality of loudspeakers assemblies in a line array is provided. The system includes a first loudspeaker assembly that includes at least one controller. The at least one controller is programmed to receive a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array. The first unique identifier is indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly. The at least one controller is further programmed to generate a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly and to transmit the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

In at least one embodiment, a method for generating a location map for a plurality of loudspeaker assemblies in a line array is provided. The method includes receiving at a first loudspeaker assembly a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array, the first unique identifier being indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly and generating, at the first loudspeaker assembly, a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly. The method further includes transmitting the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

In at least one embodiment, a computer-program product embodied in a non-transitory computer read-able medium that is programmed for generating a location map for a plurality of loudspeaker assemblies in a line array. The computer-program product includes instructions for receiving at a first loudspeaker assembly a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array, the first unique identifier being indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly and for generating, at the first loudspeaker assembly, a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly. The computer-program product includes instructions for transmitting the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

## BRIEF DESCRIPTION OF THE DRAWINGS

The embodiments of the present disclosure are pointed out with particularity in the appended claims. However, other features of the various embodiments will become more apparent and will be best understood by referring to the following detailed description in conjunction with the accompanying drawings in which:

FIG. **1** generally depicts an example of a loudspeaker assembly for a line array of loudspeakers in accordance to one embodiment;

FIG. **2** generally depicts a system for generating location map for loudspeakers orientated in the line array of loudspeakers in accordance to one embodiment;

FIG. **3** depicts a more detailed implementation of the loudspeaker assembly in accordance to one embodiment;

FIG. **4** generally depicts a message format of data as transmitted from a first loudspeaker assembly of the line array in accordance to one embodiment;

FIG. **5** depicts an example of data that is transmitted by the various loudspeaker assemblies of FIG. **2** in accordance to one embodiment; and

FIG. **6** generally depicts a method for generating the location map for the loudspeakers orientated in the line array of loudspeakers in accordance to one embodiment.

## DETAILED DESCRIPTION

As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

It is recognized that the controllers as disclosed herein may include various microprocessors, integrated circuits, memory devices (e.g., FLASH, random access memory (RAM), read only memory (ROM), electrically programmable read only memory (EPROM), electrically erasable programmable read only memory (EEPROM), or other suitable variants thereof), and software which co-act with one another to perform operation(s) disclosed herein. In addition, such controllers as disclosed utilize one or more microprocessors to execute a computer-program product that is embodied in a non-transitory computer readable medium that is programmed to perform any number of the functions as disclosed. Further, the controller(s) as provided herein includes a housing and the various number of microprocessors, integrated circuits, and memory devices (e.g., FLASH, random access memory (RAM), read only memory (ROM), electrically programmable read only memory (EPROM), electrically erasable programmable read only memory (EEPROM)) positioned within the housing. The controller(s) as disclosed also includes hardware-based inputs and outputs for receiving and transmitting data, respectively from and to other hardware-based devices as discussed herein.

It is also recognized that directional terms that may be noted herein (e.g., "upper", "lower", "inner", "outer", "top", "bottom", etc.) simply refer to the orientation of various components of a loudspeaker assembly as illustrated in the accompanying figures. Such terms are provided for context and understanding of the embodiments disclosed herein. Multiple embodiments are disclosed below and it is herein understood that similar reference numerals may be disclosed in connection with the different embodiments and that such reference numerals will not be described for every occurrence of these reference numerals in the embodiments for purposes of brevity.

Aspects disclosed herein generally utilize at least one communication transmitter (e.g., wireless electronic communication device with at least one wireless transmitter) that is positioned on a loudspeaker assembly in a line array of loudspeaker assemblies that communicate with a server (or central hub). In general, each loudspeaker assembly in the line array may be assigned a unique electronic identifier that may be transmitted to a server via the communication transmission tag. The unique electronic identifier may be in any format. At least one communication receiver (e.g., wireless electronic communication device with at least one wireless transmitter) may also be positioned on the loudspeaker assembly in the line array of loudspeaker assemblies. The communication receiver(s) for a given loudspeaker assembly in the array may receive the unique electronic identifiers from adjacent loudspeaker assemblies and the communication transmitter for the given loudspeaker assembly transmit such information to the server. This is performed for each loudspeaker assembly that is positioned in the line array. The server utilizes the unique identifier information as received from each of the loudspeaker assemblies to generate a map of the loudspeaker assemblies to identify the location for each location assembly of the line array. Thus, a user may ascertain the location of a particular loudspeaker assembly in the line array to diagnose or otherwise service the loudspeaker assembly of interest in the line array. These aspects and others will be discussed in more detail herein.

FIG. **1** generally depicts an example of a loudspeaker assembly **100** for a line array of loudspeakers **102** in accordance to one embodiment. In general, the loudspeaker assembly **100** may be positioned in a venue and playback audio data for users in the venue. In one example, the loudspeaker assembly **100** may be a subwoofer (or woofer), mid-range driver, tweeter or any combination thereof that is positioned in a housing **104**. Each of the woofer, mid-range driver, or tweeter may include at least one cone (or diaphragm) and electronics for receiving the audio for playback by any number of amplifiers also positioned in the venue. The loudspeaker assembly **100** may transmit the audio data into the venue via a first end **110** of the loudspeaker assembly **100**.

The loudspeaker assembly **100** generally includes a communication transmitter **112** and first and second communication receivers **114***a*-**114***b*, respectively. The communication transmitter **112** is generally configured to wirelessly transmit data to a server **116**. The loudspeaker assembly **100** generally stores a unique identifier that provides information corresponding to an identity of the loudspeaker assembly **100**. The first communication receiver **114***a* may be positioned on a top side of the loudspeaker assembly **100**. The second communication receiver **114***b* may be positioned on a bottom side of the loudspeaker assembly **100**. The first and the second communication receivers **114***a*, **114***b* are generally configured to receive the unique identifier from other loudspeaker assemblies that are positioned in the array **102**. This aspect will be discussed in more detail below. In one example, the communication transmitter **112** may communicate with the server **116** via WiFi, Ethernet, or other suitable wireless protocol. Additionally, the server **116**, for example, may execute instructions to run centralized software such as Performance manager, CloudworX, etc.

FIG. **2** generally depicts a system **200** for generating a location map for loudspeaker assemblies **100***a*-**100***n* orientated in the line array of loudspeakers **102** in accordance to one embodiment. The system **200** includes a plurality of loudspeaker assemblies **100***a*-**100***d* that are arranged in the line array **102**. It is recognized that the number of loudspeaker assemblies **100***a*-**100***d* utilized in the line array **102** may vary based on the desired criteria of a particular implementation. The line array **102** of the loudspeaker assemblies may be arranged vertically. It is recognized that the line array **102** may also be aligned horizontally. As illustrated in FIG. **2**, each loudspeaker assembly **100***a*-**100***d* includes the communication transmitter **112**, and the first and second communication receivers **114***a*, **114***b*.

The first and second communication receivers **114***a*, **114***b* for each of the loudspeaker assemblies **100***a*-**100***d* are generally configured to receive the unique identifier from a communication transmitter **112** of an adjacent loudspeaker assembly **100***a*-**100***b*. For example, loudspeaker assembly **100***a* receives data from loudspeaker speaker assembly

100*b*; loudspeaker assembly **100***b* receives data from loudspeaker assemblies **100***a* and **100***c*, loudspeaker assembly **100***c* receives data from loudspeaker assemblies **100***b* and **100***d*, and loudspeaker assembly **100***d* receives data from loudspeaker assembly **100***c*. In general, communication between the loudspeaker assemblies **100***a*-**100***d* may be achieved via a short-range wireless protocol such as Near Field Communication (NFC) or other suitable protocol. The short-range wireless protocol utilized in the system **200** may be advantageous to enable each loudspeaker assembly **100***a*-**100***d* to receive data/messages from loudspeaker assemblies **100***a*-**100***d* that are directly adjacent to one another.

Each loudspeaker assembly **100***a*-**100***d* transmits data corresponding to the received unique identifiers from adjacent loudspeaker assemblies **100***a*-**100***d* to the server **116**. The server **116** generates a map corresponding to the location of the loudspeaker assemblies **100***a*-**100***d* based on the unique identifiers received from the various loudspeaker assemblies **100***a*-**100***d*. The manner in which the server **116** generates the map will be discussed in more detail below.

FIG. **3** depicts a more detailed implementation of the loudspeaker assembly **100** in accordance to one embodiment. The loudspeaker assembly **100** may further include at least one controller **300** (or controller **300** hereafter) and memory **302**. The communication transmitter **110** generally includes a long-range transceiver **304** and a short-range transceiver **306**. In general, the memory **302** may store the unique identifier for a corresponding loudspeaker assembly **100**. The memory **302** may provide the unique identifier to the controller **300** which then transmits the same to the communication transmitter (or communication transceiver) **112**. The controller **300** may then instruct the communication transmitter **112** to transmit the unique identifier to the server **116** via the long-range transceiver **304**. The long-range transceiver **304** may transmit the unique identifier to the server **116** via WIFI or other suitable protocol. Additionally, the communication transmitter **112** may also transmit the unique identifier to adjacent loudspeaker assemblies **100** in the line array **102** (e.g., to the first and second communication receivers **114***a*, **114***b* via the short-range transceiver **306**). In one example, the short-range transceiver **306** may be implemented also as an NFC transceiver or other transceiver that supports short range communication.

FIG. **4** generally depicts a message format **450** for a message as transmitted from the loudspeaker assembly **100** (e.g., transmitting loudspeaker assembly **100**) of the line array **102** in accordance to one embodiment. In particular, the message format **450** is transmitted from the loudspeaker assembly **100** of the line array **102** to the server **116**. The message format **450** defines a plurality of bytes **452***a*-**452***e*. Byte **452***a* (e.g., "Byte **1**") includes information corresponding to the speaker ID (or unique identifier) of the loudspeaker speaker assembly **100** that transmits the message format **450** to the server **116**. Byte **452***b* (e.g., "Byte **2**") is indicative of an identifier to alert the server **116** that the next byte, (e.g., the **452***c*) will provide information from the second communication receiver **114***b* (e.g., the communication receiver **114***a* that is positioned near or at the bottom of the loudspeaker assembly **100**). In this case, byte **452***d* (e.g., "Byte **3**") provides the unique identifier as received from a loudspeaker assembly **100** that is positioned below the transmitting loudspeaker assembly **100**. Byte **452***d* (e.g., "Byte **4**") is indicative of an identifier to alert the server **116** that the next byte, (e.g, the **452***e*) will provide information from the second communication receiver **114***b* (e.g., the communication receiver **114***a* that is positioned near or at the top of the loudspeaker assembly **100**). In this case, byte **452***e* provides the unique identifier as received from a loudspeaker assembly **100** that is positioned above the transmitting loudspeaker assembly **100**.

It is recognized that the transmitting loudspeaker assembly **100** may transmit the message according to the message format **450** periodically, upon startup (or bootup), or on an event basis (e.g., new unique identifiers have been received and/or stored in the memory **302**. Code may be stored in the memory **302** that enables the transmitting loudspeaker assembly **100** to transmit data in the message format **450**. For example, such code may be executed by the controller **300**. The code may be represented in the following C++ example (see Table 1 below).

TABLE 1

```
Struct msg
{
Char speaker_id;
Char Position_Character1
Char upper_speaker_id;
Char Position_Character2
Char lower_speaker_id;
}
```

In the event the transmitting loudspeaker assembly **100** is unable to read a unique identifier from the first communication receiver **114***a* (or fails to receive a unique identifier from another loudspeaker assembly **100**), this condition may indicate that there are no other loudspeaker assemblies **100** positioned above the transmitting loudspeaker assembly **100**. In this case, byte **452***e* may simply provide a predefined symbol to illustrate this condition. Further, in the event the transmitting loudspeaker assembly **100** is unable to read a unique identifier from the second communication receiver **114***b* (or fails to receive a unique identifier from another loudspeaker assembly **100**), this condition may indicate that there are no other loudspeaker assemblies **100** positioned below the transmitting loudspeaker assembly **100**. In this case, byte **452***c* may simply indicate provide the predefined symbol to illustrate this condition.

Referring back to FIG. **2** and further in reference to FIG. **5**, the loudspeaker assembly **100***a* may be assigned a unique identifier "01" (e.g., see generally at **460** in FIG. **5**) and the loudspeaker assembly **100***a* is generally configured to provide the unique identifier "01" to the first communication receiver **114***a* of the loudspeaker assembly **100***b*. The loudspeaker assembly **100***b* may be assigned a unique identifier "FD" (e.g., see generally at **460** in FIG. **5**). In this case, the loudspeaker assembly **100***b* is generally configured to transmit the unique identifier "FD" to the second communication receiver **114***b* (e.g., bottom communication receiver **114***b*) of the loudspeaker assembly **100***a* and to the first communication receiver **114***a* (e.g., top communication receiver **114***a*) of the loudspeaker assembly **100***c*.

The loudspeaker assembly **100***c* may be assigned a unique identifier "FC" (e.g., see generally at **460** in FIG. **5**). In this case, the loudspeaker assembly **100***c* is generally configured to transmit the unique identifier "FC" to the second communication receiver **114***b* (e.g., bottom communication receiver **114***b*) of the loudspeaker assembly **100***b* and to the first communication receiver **114***a* (e.g., top communication receiver **114***a*) of the loudspeaker assembly **100***d*. The loudspeaker assembly **100***d* may be assigned a unique identifier "FE" (e.g., see generally at **460** in FIG. **5**) and the loudspeaker assembly **100***d* is generally configured to provide the unique identifier "FE" to the second communication receiver **114***b* of the loudspeaker assembly **100***c*. In light of

the foregoing, the unique identifiers as transmitted from the loudspeaker assemblies **100***a*-**100***d* include the following message format **450** as illustrated in FIG. **5**. It bears mentioning that "*" as illustrated in byte **452***e* for the loudspeaker assembly **100***a* denotes that the predefined symbol. "FF" indicates that loudspeaker assembly **100***a* is unable to receive the unique identifier from a loudspeaker assembly positioned above the loudspeaker assembly **100***a*. For example, the loudspeaker assembly **100***d* is positioned at the top of the line array **102**. In addition, "*" as illustrated in the byte **452***c* denotes that the loudspeaker assembly **100***d* is unable to receive the unique identifier from a loudspeaker assembly positioned below the assembly **100***d*. For example, the loudspeaker assembly **100***d* is positioned at the bottom of the line army **102**.

It is recognized that the various loudspeaker assemblies **100***a*-**100***d* may transmit the messages as illustrated in FIG. **5**, for example, in any order to the server **116**. The server **116** may generate the position or location map of the loudspeaker assemblies **100***a*-**100***d* based on the data as illustrated in FIG. **5**. The manner in which the server **116** may assemble or generate the location map will be discussed in more detail in connection with FIG. **6**.

FIG. **6** generally depicts a method **500** for generating the location map for loudspeaker assemblies **100** orientated in the line array **102** in accordance to one embodiment.

In operation **502**, the server **116** receives and stores the random messages from the various loudspeaker assemblies **100***a*-**100***d* in the message format **450** (e.g., see data transmitted by the loudspeaker assemblies **100***a*-**100***d* as illustrated in FIG. **5**). In operation **504**, the server **116** reads byte **452***e* from the received message formats **450** to obtain information corresponding to "upper" loudspeaker assemblies **100***a*-**100***d* or the corresponding loudspeaker speaker assemblies that are positioned above the transmitting loudspeaker assembly.

In operation **506**, the server **116** determines whether the data positioned in byte **452***e* corresponds to the predefined symbol "FF". As indicated above, the predefined symbol "FF" is indicative of a corresponding loudspeaker assembly **100** that is unable to receive the unique identifier from a loudspeaker assembly positioned above the corresponding loudspeaker assembly **100**. In the event the predefined symbol FF is found in byte **452***e*, then the method **500** proceeds to operation **510**. If not, then the method **500** proceeds to operation **508**.

In operation **508**, the server **116** reads the next message as received from a different loudspeaker assembly **100**. In operation **510**, the server **116** assigns the unique identifier for the loudspeaker assembly **100***a* as the loudspeaker assembly **100***a* that is positioned at a top position in the line array **102** since in this example, the loudspeaker assembly **100***a* does not have a loudspeaker assembly positioned there above. As illustrated FIG. **5**, the loudspeaker assembly **100***a* includes "FF" positioned in byte **452***e*.

In operation **512**, the server **116** reads the byte **452***c* of the same message that includes the predefined symbol "FF" in the byte **452***e*. In this case, the server **116** is attempting to locate the corresponding loudspeaker assembly that is positioned below the top (or upper most) loudspeaker assembly **100** in the line array **102**.

In operation **514**, the server **116** determines whether the data positioned in byte **452***c* corresponds to the predefined symbol "FF". As indicated above, the predefined symbol "FF" is also indicative of a corresponding loudspeaker assembly **100** that is unable to receive the unique identifier from a loudspeaker assembly positioned below the corresponding loudspeaker assembly **100**. In the event the predefined symbol FF is found in the byte **452***c*, then the method **500** proceeds to operation **515** which is the end of the map generation process (or ends the generation of the location map for the loudspeaker assemblies **100** in the array **102**). If not, then the method **500** proceeds to operation **516** to continue to locate the loudspeaker assembly **100** that transmits predefined symbol "FF" in the byte **452***c*.

In operation **515**, the server **116** assigns the unique identifier for the loudspeaker assembly **100***d* as the loudspeaker assembly **100***d* that is positioned at a bottom position in the line array **102** since in this example, the loudspeaker assembly **100***d* does not have a loudspeaker assembly positioned below it.

In operation **516**, the server **116** receives and stores the next message from the remaining loudspeaker assemblies **100***b* and **100***c* to determine their respective positions relative to the top loudspeaker assembly **100***a* (e.g., the loudspeaker assembly **100***a*).

In operation **517**, the server **116** compares data in byte **452***c* of the previous message to the data (or unique identifier) stored in byte **452***a* of the currently received message from operation **516**. If the data in byte **452***c* of the previous message matches the date (or unique identifier) stored in byte **452***a*, then the method **500** proceeds to operation **518**. If not, then the method **500** proceed back to operation **516**.

In operation **518**, the server **116** assigns the unique identifier for the loudspeaker assembly as received in operation **516** to the next position in the map (e.g., this loudspeaker assembly is assigned to a position below the loudspeaker assembly **100** (i.e., the top loudspeaker assembly) as determined in operation **510**. In this case, the method **500** proceeds back to operation **512** to determine if there are any additional loudspeaker assemblies positioned below loudspeaker assigned in operation **518**. In general, the method **500** continues to loop back through operations **512**, **514**, **516**, **517** and **518** until the predefined symbol "FF" is found to be in byte **452***c* for subsequently received messages.

In general, the system **200** and the method **500** illustrates that once the top loudspeaker assembly is located or assigned in the map, the system **200** and the method **500** may then determine the remaining locations of the loudspeaker assemblies positioned below the top loudspeaker assemblies based on reviewing the data in the bytes **452***c* and **452***e* for the messages received from such loudspeaker assemblies. It is recognized that the system **200** and the method **500** may be modified or revised such that the bottom loudspeaker assembly is located or assigned in the map first as opposed to the top loudspeaker. Once the bottom loudspeaker assembly is located, the system **200** and the method **500** may then determine the remaining locations of the loudspeaker assemblies positioned above the bottom loudspeaker based on reviewing the data in the bytes **452***c* and **452***e*.

It is further recognized that the system **200** and the method **500** may generate a location map for the array **102** for loudspeaker assemblies **100** that are arranged horizontally. For example, in this case, the first communication receiver **114***a* may be positioned on a left side of the loudspeaker assembly **100** and the second communication receiver **114***b* may be positioned on a right side of the loudspeaker assembly **100**. The system **200** and the method **500** may then determine which of the loudspeaker assemblies is positioned on a far left side of the array **201** and determine the remaining locations adjacent to the loudspeaker assembly positioned on the far left side to the

position of the loudspeaker assembly positioned on the far right side of the array **102** based on the teachings disclosed herein.

While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention. Additionally, the features of various implementing embodiments may be combined to form further embodiments of the invention.

What is claimed is:

**1**. A system for generating a location map for a plurality of loudspeakers assemblies in a line array, the system comprising:

a first loudspeaker assembly including:

at least one controller being programmed to:

receive a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array, the first unique identifier being indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly;

generate a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly; and

transmit the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

**2**. The system of claim **1**, wherein the at least one controller is further programmed to insert a predefined symbol into the message in the event the at least one controller only receives the first unique identifier from the first adjacent loudspeaker assembly and fails to receive another unique identifier from another adjacent loudspeaker assembly.

**3**. The system of claim **2**, wherein the at least one controller is further programmed to transmit a message including the first unique identifier and the predefined symbol to the server.

**4**. The system of claim **3**, wherein the server is programmed to determine that the first loudspeaker assembly is located above the first adjacent loudspeaker assembly or below the first adjacent loudspeaker assembly based on the first unique identifier and the predefined symbol.

**5**. The system of claim **1**, wherein the first loudspeaker assembly includes a first communication receiver positioned on a top side of the first loudspeaker assembly and a second communication receiver positioned on a bottom side of the first loudspeaker assembly.

**6**. The system of claim **5**, wherein one of the first communication receiver and the second communication receiver is programmed to receive the first unique identifier from the first adjacent loudspeaker assembly.

**7**. The system of claim **6**, wherein the at least one controller is further programmed to insert a predefined symbol in the message in the event the first communication receiver fails to receive another unique identifier from another adjacent loudspeaker assembly and the second communication receiver receives the first unique identifier from the first adjacent loudspeaker assembly.

**8**. The system of claim **7**, wherein the server is programmed to determine that the first loudspeaker assembly is located above the first adjacent loudspeaker assembly based on the predefined symbol and the first unique identifier.

**9**. The system of claim **6**, wherein the at least one controller is further programmed to insert a predefined symbol in the message in the event the second communication receiver fails to receive another unique identifier from another adjacent loudspeaker assembly and the first communication receiver receives the first unique identifier from the first adjacent loudspeaker assembly.

**10**. The system of claim **9**, wherein the server is programmed to determine that the first loudspeaker assembly is located below the first adjacent loudspeaker assembly based on the predefined symbol and the first unique identifier.

**11**. A method for generating a location map for a plurality of loudspeaker assemblies in a line array, the method comprising:

receiving at a first loudspeaker assembly a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array, the first unique identifier being indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly;

generating, at the first loudspeaker assembly, a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly; and

transmitting the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

**12**. The method of claim **11** further comprising inserting a predefined symbol into the message in the event the first loudspeaker assembly only receives the first unique identifier from the first adjacent loudspeaker assembly and fails to receive another unique identifier from another adjacent loudspeaker assembly.

**13**. The method of claim **12** further comprising transmitting the message including the first unique identifier and the predefined symbol to the server.

**14**. The method of claim **13** further comprising determining that the first loudspeaker assembly is located above the first adjacent loudspeaker assembly or below the first adjacent loudspeaker assembly based on the first unique identifier and the predefined symbol.

**15**. The method of claim **11**, wherein the first loudspeaker assembly includes a first communication receiver positioned on a top side of the first loudspeaker assembly and a second communication receiver positioned on a bottom side of the first loudspeaker assembly.

**16**. The method of claim **15** further comprising receiving, at one of the first communication receiver and the second communication receiver, the first unique identifier from the first adjacent loudspeaker assembly.

**17**. The method of claim **16** further comprising inserting a predefined symbol in the message in the event the first communication receiver fails to receive another unique identifier from another adjacent loudspeaker assembly and the second communication receiver receives the first unique identifier from the first adjacent loudspeaker assembly.

**18**. The method of claim **17** further comprising determining at the server that the first loudspeaker assembly is located above the first adjacent loudspeaker based on the predefined symbol and the first unique identifier.

**19**. The method of claim **16** further comprising inserting a predefined symbol in the message in the event the second communication receiver fails to receive another unique identifier from another adjacent loudspeaker assembly and the first communication receiver receives the first unique identifier from the first adjacent loudspeaker assembly.

20. A computer-program product embodied in a non-transitory computer read-able medium stored in memory and that is executable by at least one controller programmed to generate a location map for a plurality of loudspeaker assemblies in a line array, the computer-program product comprising instructions for:

receiving at a first loudspeaker assembly a first unique identifier from a first adjacent loudspeaker assembly positioned in the line array, the first unique identifier being indicative of a location of the first adjacent loudspeaker assembly relative to the first loudspeaker assembly;

generating, at the first loudspeaker assembly, a message including the first unique identifier which is indicative of a location the first adjacent loudspeaker assembly relative to the first loudspeaker assembly; and

transmitting the message to a server to generate the location map of the first loudspeaker assembly relative to the first adjacent loudspeaker assembly.

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