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ACOUSTIC SYSTEM

Abstract

An an acoustic system, which is applied to a vehicle, includes a detachable speaker and a base device. The detachable speaker includes a first housing having a positioning groove, a joining groove and a latching rod arranged in the engagement groove. The base device includes a second housing having an accommodating groove, a positioning member disposed on the lateral wall of the accommodating groove and a locking member disposed on the bottom surface of the accommodating groove. When the detachable audio speaker is selectively joined to the base device, the detachable speaker is accommodated in the accommodating groove, the positioning disc of the positioning member is joined to the positioning groove, and the locking member locks the latching rod.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS [0001] This claims priority of U.S. Provisional Application No. 63/556, 104 filed on Feb. 21, 2024 under 35 U.S.C. § 119 (e), the entire contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The invention relates to a technical field of acoustic technology, and more particularly to an acoustic system.

Description of the Related Art

[0003] As vehicle technologies develop, acoustic systems have become essential equipment for most vehicles. Since the number and mounting positions of speakers may greatly affect the acoustic effect and the speakers of conventional acoustic systems for vehicles are often mounted in predetermined positions, the acoustic effect generated by the conventional acoustic system may be unable to satisfy users' requirements. The users must re-equip new acoustic systems for their further requirements. However, such reequipping incurs costs.

[0004] Moreover, as the requirements for various scenarios of utilization in vehicles have increased, the installation of speakers in predetermined positions cannot satisfy the aforementioned requirements (for example, the scenarios of music listening or movie watching) and, thus, provides users with poor experiences.

[0005] Therefore, it is an important issue for persons skilled in the art to develop an acoustic system applied to vehicles and satisfying the aforementioned requirements so as to promote users' experiences.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention provides an acoustic system applied to vehicles, which solves the aforementioned problems of the conventional acoustic system.

[0007] The acoustic system in accordance with an exemplary embodiment of the invention includes a detachable speaker and a base device. The detachable speaker includes a first housing having a positioning groove and a joining groove disposed on different surfaces, and a latching rod having two ends connected to two lateral walls of the joining groove respectively, wherein the latching rod is distanced from a bottom of the joining groove. The base device includes a second housing having an accommodating groove, a positioning member disposed at a lateral wall of the accommodating groove and located at a position corresponding to a position of the positioning groove and having a positioning disc, and a locking member disposed at a bottom of the accommodating groove, wherein the locking member is located at a position corresponding to a position of the joining groove. When the detachable speaker is selectively joined to the base device, the detachable speaker is accommodated in the accommodating groove, the positioning disc is joined to the positioning groove, and the locking member locks the latching rod.

[0008] As the acoustic system of the invention has the mechanisms designed in the detachable speaker and the base device (i.e., a positioning groove, a joining groove and a latching rod of the detachable speaker, and an accommodating groove, a positioning member and a locking member of the base device), the detachable speaker is selectively joined to the base device. Moreover, the detachable speaker, when separated from the base device, can be placed in an arbitrary position of a vehicle equipped with the acoustic system, thereby providing various sound fields to meet

requirements of users. The detachable speaker can also be used in a position external to the vehicle. The acoustic system of the present invention increases the range of utilization experiences for the user.

[0009] A detailed description is given in the following embodiments with reference to the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The invention can be more fully understood by reading the subsequent detailed description and examples with references made to the accompanying drawings, wherein:

[0011] FIG. 1 is a perspective view of an embodiment of an acoustic system of the present invention;

[0012] FIG. 2 shows a utilization scenario of the acoustic system of FIG. 1;

[0013] FIG. 3 shows a utilization scenario of the acoustic system of the present invention mounted or secured in an interior of a vehicle;

[0014] FIG. 4 is an exploded view of a first embodiment of an acoustic system of the present invention viewed at a first viewing angle;

[0015] FIG. 5 is an exploded view of a first embodiment of an acoustic system of the present invention viewed at a second viewing angle;

[0016] FIG. 6 is an enlarged view of region F in FIG. 5;

[0017] FIG. 7 is a block diagram of a circuit of an embodiment of an acoustic system of the present invention;

[0018] FIG. 8 is an enlarged view of region G in FIG. 4;

[0019] FIG. 9 is an enlarged view of region H in FIG. 5;

[0020] FIG. 10 is an enlarged view of region I in FIG. 4;

[0021] FIG. 11 is an exploded view of a second embodiment of an acoustic system of the present invention viewed at the first viewing angle;

[0022] FIG. 12 is an exploded view of a second embodiment of an acoustic system of the present invention viewed at the second viewing angle;

[0023] FIG. 13 is an exploded view of a third embodiment of an acoustic system of the present invention viewed at the first viewing angle;

[0024] FIG. 14 is an exploded view of a third embodiment of an acoustic system of the present invention viewed at the second viewing angle;

[0025] FIG. 15 is an exploded view of a fourth embodiment of an acoustic system of the present invention viewed at the first viewing angle;

[0026] FIG. 16 is an exploded view of a fourth embodiment of an acoustic system of the present invention viewed at the second viewing angle;

[0027] FIG. 17 is a block diagram of a circuit of the first embodiment of the acoustic system of the present invention connected to an electronic device; and

[0028] FIG. 18 is a block diagram of a circuit of the second embodiment of the acoustic system of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0029] The following description is of the best-contemplated mode of carrying out the invention. This description is made for the purpose of illustrating the general principles of the invention and should not be taken in a limiting sense. The scope of the invention is best determined by reference to the appended claims.

[0030] It should be understood that when a component is described as being “connected” or “coupled” to another component, it may be directly connected or coupled to the other component,

or indirectly connected or coupled via intervening components. Conversely, when a component is described as being “directly connected” or “directly coupled” to another component, there are no intervening components between them. Furthermore, although the terms “first,” “second,” and so on are used herein to describe different elements, they are solely intended to distinguish elements or operations described using the same technical terminology.

[0031] Referring to FIGS. 1 and 2, an acoustic system **100** includes a detachable speaker **110** and a base device **120**. The detachable speaker **110** is selectively joined to the base device **120**. The acoustic system **100** is applied to vehicles (not shown). Specifically, the base device **120** is secured or mounted to an interior of the vehicle. For example, the base device **120** can be secured or mounted to any desired side of an armrest box **3** between a driver's seat **1** and a front passenger seat **2** (as shown in FIG. 2). The present invention is not limited thereto. The position of the base device **120** secured or mounted in the interior of the vehicle or the number of the acoustic systems **100** for a single vehicle can be adjusted or designed according to requirements (for example the requirements for construction of a sound field). In other words, referring to FIG. 3, the base device **120** can also be secured or mounted to an inner side (a region A) of a door at the driver's seat, an inner side (a region B) of a door at the front passenger's seat, a side (a region C) of the armrest box facing a roof of the vehicle between the driver's seat and the front passenger's seat, an external side (region D) of the glove box in front of the front passenger's seat and/or an upper side (region E) of a dashboard. The present invention is not limited thereto.

[0032] Moreover, the base device **120** can be mounted in an interior of a vehicle during construction of the interior or be secured or mounted in the vehicle to meet the demands of users. The method for mounting the acoustic system in the interior of the vehicle can be adjusted according to requirements. For example, the base device **120** can be secured or mounted to the interior of the vehicle by bolts, pins or adhesives.

[0033] Referring to FIGS. 4 to 6, the acoustic system **100** includes a detachable speaker **110** and a base device **120**. The detachable speaker **110** includes a first housing **111** and a latching rod **112**. The first housing **111** has a positioning groove **50** and a joining groove **60**. Two opposite ends of the latching rod **112** are connected to two opposite lateral walls **61** and **62** of the joining groove **60**. The latching rod **112** is distanced from a bottom **63** of the joining groove **60** (i.e., the latching rod **112** has no contact with the bottom **63** of the joining groove **60**). The base device **120** is communicatively connected to a vehicle acoustic system (not shown) and includes a second housing **121**, a positioning member **122** and a locking member **123**. The second housing **121** has an accommodating groove **70**. That is, the second housing **121** has a substantially U-shaped structure. The second housing **121** has a central depression serving as the accommodating groove **70**. The accommodating groove **70** has a first lateral wall **71**, a second lateral wall **72** and a third lateral wall **73**. The positioning member **122** is disposed on the first lateral wall **71** of the accommodating groove **70**. The positioning member **122** is provided with a positioning disc **122a**. The positioning member **122** is located at a position corresponding to a position of the positioning groove **50**. The locking member **123** is disposed on the second lateral wall **72** of the accommodating groove **70**. The locking member **123** is located at a position corresponding to a position of the joining groove **60**.

[0034] When the detachable speaker **110** is selectively joined to the base device **120**, the detachable speaker **110** is received in the accommodating groove **70** (as shown in FIG. 1). The positioning disc **122a** is joined to the positioning groove **50**, and the locking member **123** locks the latching rod **112**. Therefore, the mechanisms of the detachable speaker **110** and the base device **120** (i.e., a positioning groove **50**, a joining groove **60** and a latching rod **112** of the detachable speaker **110**, and an accommodating groove **70**, a positioning member **122** and a locking member **123** of the base device **120**) enable the selective joining of the detachable speaker **110** and the base device **120**. Specifically, the positioning groove **50** provides a depressed groove (such as a U-shaped groove) for insertion of the positioning disc **122a**. The positioning groove **50** provides a guiding

function for the positioning disc **122a** smoothly moving into the positioning groove **50** and being tightly fitted thereto, whereby the detachable speaker **110** is fixed to the base device **120** to reduce impact or vibration in the vehicle, and it also reduces the cost of the vehicle and simplifies a structure of docking devices for the vehicle.

[0035] Referring to FIG. 4, FIG. 5 and FIG. 7, the detachable speaker **110** further includes a communication module **113** disposed in the first housing **111**. The base device **120** further includes a detecting module **124** and a connection module **125** both disposed in the second housing **121**. The detecting module **124** is configured to detect the engagement of the detachable speaker **110** and the base device **120**. The connection module **125** is connected to the detecting module **124** and configured to establish a wireless connection with the communication module **113** when the detecting module **124** detects that the detachable speaker **110** is not joined to the base device **120**, whereby the detachable speaker **110** synchronously produces sound according to audio signals generated by the acoustic system through the wireless connection between the connection module **125** and the communication module **113**. In contrast, when the detecting module **124** detects that the detachable speaker **110** is joined to the base device **120**, the detachable speaker **110** is connected to the communication module **113** by a wired connection through the connection module **125** to produce sound according to the audio signal generated by the acoustic system. In addition, in one embodiment, whether or not the detachable speaker **110** is connected to the base device **120**, the user can also set the detachable speaker **110** through a control interface (e.g., touch interface) so as to wirelessly connect the detachable speaker **110** to an external device (e.g., a mobile phone) to produce sound according to the audio signals transmitted from the external device.

[0036] The base device **110** can be wirelessly connected or connected by a hardwire connection to the acoustic system through the connection module **125**, thereby communicating with the acoustic system. The wired connection may include a wired connection for communication through ports such as a USB port and an HDMI port. The wireless connection may include one or more wireless connections for communication through technologies such as Bluetooth, Wi-Fi, and radio frequency. In addition, the detecting module **124** may be mounted on a lateral wall of the accommodating groove **70**, and the detecting module **124** may include a distance sensor or a pressure sensor. For example, the distance sensor may be mounted to the second lateral wall **72** of the accommodating groove **70**. When the distance sensor detects the distance of the detachable speaker **110** to be less than a default value (for example, 1 cm) for a default time period (for example, 5 seconds), the distance sensor determines that the detachable speaker **110** is joined to the base device **120**. The distance sensor may be an infrared sensor, an ultrasonic sensor, or a laser sensor. The pressure sensor can be mounted to the second lateral wall **72** of the accommodating groove **70**. When the pressure sensor detects a weight of an object for a default time period (for example, 5 seconds), the pressure sensor determines that the detachable speaker **110** is joined to the base device **120**. In addition, the wireless connection between the connection module **125** and the communication module **113** may include one or more wireless connections for communication via Bluetooth, Wi-Fi, radio frequency, and other technologies.

[0037] Therefore, through the circuit design of the detachable speaker **110** and the base device **120** (i.e., the base device **110** is connected to the acoustic system of a vehicle in a communicative manner, and when the detecting module **124** detects that the detachable speaker **110** is not joined to the base device **120**, the detachable speaker **110** synchronously produces sound according to the audio signals generated by the acoustic system through the wireless connection between the connection module **125** and the communication module **113**), the detachable speaker **110** that is not joined to the base device **120** and synchronously produces sound according to the audio signals generated by the acoustic system can be placed at any position within the vehicle, thereby functioning in conjunction with the acoustic system mounted in the vehicle to meet the user's requirements for a sound field and for utilization outside the vehicle to improve the user experience.

[0038] In one embodiment, referring to FIG. 4 and FIG. 8, the locking member 123 may include a first clamping portion 80 and a second clamping portion 90, the first clamping portion 80 is provided with a first clamping groove 81, and the second clamping portion 90 is provided with a second clamping groove 91. The first clamping portion 80 and the second clamping portion 90 are arranged adjacent to each other (for example, the first clamping portion 80 and the second clamping portion 90 are arranged closely together), and the first clamping groove 81 corresponds to the second clamping groove 91 (that is, the opening of the first clamping groove 81 corresponds to the opening of the second clamping groove 91, and the opening of the first clamping groove 81 is opposite to the opening of the second clamping groove 91), whereby when the detachable speaker 110 is selectively joined to the base device 120, the latching rod 112 is pushed between the opening of the first clamping portion 80 and the opening of the second clamping portion 90. The first clamping portion 80 and the second clamping portion 90 are pushed away from each other, whereby the latching rod 112 is pushed between the first clamping groove 81 and the second clamping groove 91 such that the first clamping groove 81 and the second clamping groove 91 lock the latching rod 112 (that is, the locking member 123 is a mechanical lock). Specifically, when the detachable speaker 110 moves toward the base device 120, the latching rod 112 can enter the first clamping groove 81 and the second clamping groove 91 from the depressed portion between the first clamping portion 80 and the second clamping portion 90, whereby the first clamping groove 81 and the second clamping groove 91 can constrain the latching rod 112 due to the depressed design, thereby locking the latching rod 112.

[0039] In one embodiment, the locking member 123 may be an electromagnetic locking member (a solenoid locking member), and the base device 120 may also include a control module 126 connected to the electromagnetic locking member (as shown in FIG. 7). The control module 126 is connected to the detecting module 124 and configured to control the locking of the electromagnetic locking member when the detecting module 124 detects that the detachable speaker 110 is joined to the base device 120. For example, the first clamping portion 80 and the second clamping portion 90 can be controlled by the control module 126. The first clamping portion 80 and the second clamping portion 90 may be made of a material that generates a magnetic field through induction, and the latching rod 112 may be made of a material that is attracted by the magnetic field (e.g., iron or ferrous alloy). When the detecting module 124 detects that the detachable speaker 110 is joined to the base device 120, the first clamping groove 81 and the second clamping groove 91 constrain the latching rod 112, and current flows through the control module 126, whereby the first clamping portion 80 and the second clamping portion 90 generate a magnetic field to attract the latching rod 112 (i.e., the electromagnetic locking member is in a locked state), thereby further locking the latching rod 112. In one embodiment, the base device 120 may be provided with an unlocking button 12 (as shown in FIGS. 4, 5, and 7) connected to the control module 126. When the user wants to detach the detachable speaker 110 from the base device 120, the user can press the unlock button 12, whereby the control module 170 controls the electromagnetic locking member to demagnetize so that the user can easily detach the detachable speaker 110. In addition, in one embodiment, the first clamp portion 80 can be made of a material that generates a magnetic field through induction, and the second clamp portion 90 can be made of a material attracted by a magnetic field (e.g., iron). When the detecting module 124 detects that the detachable speaker 110 is joined to the base device 120, the first clamp portion 80 can tightly attract the second clamp portion 90 to constrain the latching rod 112 between the first clamp groove 81 and the second clamp groove 91.

[0040] In one embodiment, referring to FIGS. 4, 5, 9 and 10, the positioning member 122 may further include a positioning base 122b, one end of which is connected to the second housing 121 and the other end of which is provided with a positioning disc 122a. The positioning groove 50 may include a mounting groove 51, and a lateral wall of the mounting groove 51 is provided with a limiting groove 52, whereby when the detachable speaker 110 is selectively engaged with the base

device **120**, the positioning disc **122a** can move into the limiting groove **52** along the limiting groove **52**, the positioning base **122b** is accommodated in the mounting groove **51**, and the positioning disc **122a** is tightly fitted to the limiting groove **52**. The horizontal cross-sectional area of the positioning disc **122a** may be greater than that of the positioning base **122b**, and the material of the positioning disc **122a** may be silicone rubber, or the material surrounding the positioning disc **122a** may include silicone rubber to constitute a structure tightly fitted to the limiting groove **52**. Therefore, as the positioning base **122b** is accommodated in the mounting groove **51** and the positioning disc **122a** is tightly fitted to the limiting groove **52**, the positioning member **122** is positioned in the X direction, the Y direction, and the Z direction, whereby the positioning member **122** remains stationary during the movement of the vehicle, thereby reducing the possibility of the acoustic system **100** vibrating and producing sounds of rattling and buzzing. In one embodiment, the positioning member **122** may also function as an electromagnetic locking member, at least a portion of the positioning member **122** can be made of a material generating a magnetic field through electromagnetic control, and at least a portion of the positioning groove **50** can be made of a material attracted by the magnetic field (e.g., iron) and corresponds to the position of at least a portion of the positioning member **122** generating a magnetic field. When the detecting module **124** detects that the detachable speaker **110** is joined to the base device **120**, at least a portion of the positioning member **122** generates a magnetic field and magnetically attracts at least a portion of the positioning groove **50**, thereby securing the positioning member **122** in the positioning groove **50**. In particular, in this embodiment, since the positioning member **122** already functions as an electromagnetic locking member, the locking member **123** may be designed to function as only a mechanical locking member without an electromagnetic locking function.

[0041] In one embodiment, the mounting groove **51** can be a U-shaped groove or a V-shaped groove.

[0042] In one embodiment, the contour of the positioning base **122b** may correspond to the contour of the mounting groove **51**. That is, the contour shape of the positioning base **122b** is similar to or the same as that of the mounting groove **51**.

[0043] In one embodiment, the second housing **121** is an approximately U-shaped structure, which may include a main body **10**, a first protrusion portion **20** and a second protrusion portion **30**. The first protrusion portion **20** and the second protrusion portion **30** are disposed at two opposite sides of the main body **10** to form an accommodating groove **70**, and the second lateral wall **72** of the accommodating groove **70** is located on the main body **10** (as shown in FIG. 4). In one embodiment, the volume of the accommodating groove **70** is substantially identical to that of the detachable speaker **110**, whereby the detachable speaker **110** can be embedded in the accommodating groove **70** and tightly fitted to the accommodating groove **70**. The first lateral wall **71**, the second lateral wall **72** and the third lateral wall **73** of the accommodating groove **70** respectively cover a top surface **115**, a lateral surface **116** and a bottom surface **117** of the detachable speaker **110**.

[0044] In one embodiment, the positioning member **122** is disposed on the first protrusion portion **20** and the locking member **123** is disposed on the main body **10** (as shown in FIGS. 4 and 5).

[0045] In one embodiment, the positioning member **122** is disposed on the second protrusion portion **30** and the locking member **123** is disposed on the main body **10** (as shown in FIGS. 11 to 14).

[0046] In one embodiment, the locking member **123** disposed on the main body **10** is disposed near the first protrusion portion **20** (as shown in FIGS. 13 and 14) or near the second protrusion portion **30** (as shown in FIGS. 11 and 12). The locking member **123** being close to the first protrusion portion **20** means that a distance between the locking member **123** and the first protrusion portion **20** is smaller than a distance between the locking member **123** and the second protrusion portion **30**. The locking member **123** being close to the second protrusion portion **30** means that a distance between the locking member **123** and the second protrusion portion **30** is smaller than a distance

between the locking member **123** and the first protrusion portion **20**.

[0047] In one embodiment, the locking member **123** is disposed on the main body **10**. The number of the positioning members **122** is two, and the number of the positioning grooves **50** is also correspondingly two. The two positioning members **122** are respectively disposed on the first protrusion portion **20** and the second protrusion portion **30** (that is, the two positioning members **122** are respectively disposed on the first lateral wall **71** and the third lateral wall **73** of the accommodating groove **70**). The positions of the two positioning grooves **50** correspond to the positions of the two positioning members **122**, whereby when the detachable speaker **110** is selectively joined to the base device **120**, the positioning discs **122a** of the two positioning members **122** engage the two positioning grooves **50** respectively (as shown in FIGS. **15** and **16**).

[0048] As shown in FIGS. **4**, **5**, **11** and **16**, the different embodiments differ in the mounting positions of the locking member **123** and/or the number and the mounting position of the positioning member **122**. The actual mounting position of the locking member **123** and/or the number and mounting position of the positioning member **122** can be adjusted and designed according to actual requirements.

[0049] In one embodiment, referring to FIGS. **4**, **5** and **17**, the detachable speaker **110** may also include a rechargeable battery **114** disposed in the first housing **111**, and the rechargeable battery **114** is configured to provide power to the detachable speaker **110**. The base device **120** also includes a wireless charging module **127** disposed in the second housing **121**, the wireless charging module **127** is connected to the detecting module **124**, and a position of the wireless charging module **127** corresponds to a position of the rechargeable battery **114**, whereby when the detachable speaker **110** is selectively joined to the base device **120**, the wireless charging module **127** wirelessly charges the rechargeable battery **114**. It should be noted that the power for the base device **120** can be directly obtained from the acoustic system in the vehicle or the vehicle's power system, and the wireless charging module **127** can wirelessly transmit the obtained power to the rechargeable battery **114**, but it is not limited thereto. The way in which the base device **120** obtains power from the acoustic system in the vehicle or the vehicle's power system can be, but is not limited to, the base device **120** being directly connected to the acoustic system in the vehicle or to the vehicle's power system through a power connection cable to obtain power.

[0050] In one embodiment, referring to FIG. **17**, when the detecting module **124** detects that the detachable speaker **110** is not joined to the base device **120**, the communication module **113** can also selectively establish a wireless connection with an electronic device **130** (for example, a smart phone or a laptop computer) through the user's operation interface (for example, a touch interface) thereon, whereby when the acoustic system in the vehicle is not playing any audio, the detachable speaker **110** produces sound according to the audio signals from the electronic device **130** through the communication module **113**. The wireless connection between the electronic device **130** and the communication module **113** includes one or more wireless connections for communication via Bluetooth, Wi-Fi or radio frequency, etc. In one embodiment, when the detachable speaker **110** is not joined to the base device **120**, the detachable audio speaker **110** can establish wireless connections with the acoustic system in the vehicle and the electronic device **130** via the communication module **113** at the same time, but the audio signals from the acoustic system are given priority over the audio signals from the electronic device **130**. When the acoustic system in the vehicle is deactivated, the detachable speaker **110** will produce sound according to the audio signals from the electronic device.

[0051] In one embodiment, referring to FIGS. **11**, **12** and **18**, the detachable speaker **110** shown in FIG. **18** may include, in addition to the communication module **11** of FIG. **7**, a rechargeable battery **114** disposed in the first housing **111**. The first housing **111** has a first electrode **119a** and a second electrode **119b** exposed externally. The first electrode **119a** and the second electrode **119b** are connected to the rechargeable battery **114**. The rechargeable battery **114** is configured to provide power for the operation of the detachable speaker **110**. In addition to the detecting module **124**, the

connection module **125** and the control module **126** of FIG. 7, the base device **120** further includes a power conversion module **128** disposed in the second housing **121**, a first spring electrode **129a** and a second spring electrode **129b** (e.g., POGO PIN) exposed externally to the second housing **121** and connected to the power conversion module **128**. When the detachable speaker **110** is selectively joined to the base device **120**, the first electrode **119a** is pressed onto the first spring electrode **129a**, the second electrode **119b** is pressed onto the second spring electrode **129b**, and the power conversion module **128** charges the rechargeable battery **114**. Specifically, when the detachable speaker **110** is selectively joined to the base device **120**, the power conversion module **128** converts the power obtained from the acoustic system in the vehicle or the vehicle's power system into a default voltage (for example, 5 volts) and then charges the rechargeable battery **114** with the default voltage.

[0052] As aforementioned, in the acoustic system of the present application, the detachable speaker and the base device have specified mechanisms (that is, the positioning groove, the joining groove and the latching rod of the detachable speaker and the accommodating groove, the positioning member and the locking member of the base device) whereby the detachable speaker can be selectively joined to the base device. In addition, the detachable speaker, when not connected to the base device, can be placed at any position in the vehicle to work in conjunction with the acoustic system installed in the vehicle to meet the user's requirements for the desired sound field, or it can be used outside the vehicle, thereby improving the user experience. In addition, through the circuit design of the detachable speaker and the base device (that is, the base device is connected to the acoustic system of the vehicle in a communicative manner), the detachable speaker not connected to the base device can produce sound according to the audio signals played by the acoustic system in the vehicle synchronously through the wireless connection between the connection module and the communication module.

[0053] While the invention has been described by way of example and in terms of preferred embodiments, it is to be understood that the invention is not limited thereto. On the contrary, the invention is intended to cover various modifications and similar arrangements (as would be apparent to those skilled in the art). Therefore, the scope of the appended claims should be accorded the broadest interpretation so as to encompass all such modifications and similar arrangements.

Claims

1. An acoustic system utilized in vehicles, comprising: a detachable speaker, comprising: a first housing having a positioning groove and a joining groove disposed on different surfaces; and a latching rod having two ends connected to two lateral walls of the joining groove respectively, and being distanced from a bottom of the joining groove; a base device, comprising: a second housing having an accommodating groove; a positioning member disposed at a lateral wall of the accommodating groove and located at a position corresponding to a position of the positioning groove, the positioning member comprising a positioning disc; and a locking member disposed at a bottom of the accommodating groove, and located at a position corresponding to a position of the joining groove, wherein, when the detachable speaker is selectively joined to the base device, the detachable speaker is accommodated in the accommodating groove, the positioning disc is joined to the positioning groove, and the locking member locks the latching rod.
2. The acoustic system as claimed in claim 1, wherein the locking member comprises: a first clamping portion having a first clamping groove; and a second clamping portion having a second clamping groove, the first clamping portion is adjacent to the second clamping portion, wherein an opening of the first clamping groove corresponds to an opening of the second clamping groove, and wherein, when the detachable speaker is selectively joined to the base device, the latching rod is pushed into the portions between the openings of the first clamping groove and the second

clamping groove so as to move the first clamping portion and the second clamping portion away from each other, whereby the latching rod is pushed into a portion between the first clamping groove and the second clamping groove and latched by the first clamping groove and the second clamping groove.

3. The acoustic system as claimed in claim 1, wherein the detachable speaker further comprises a communication module disposed in the first housing, and wherein the base device further comprises: a detecting module disposed in the second housing and configured to detect a joining condition of the detachable speaker and the base device; and a connection module disposed in the second housing and connected to the detecting module, wherein the connection module is wirelessly connected to the communication module when a disconnection of the detachable speaker and the base device is detected by the detecting module, whereby the detachable speaker produces sound according to audio signals generated by the acoustic system through the wireless connection of the connection module and the communication module.

4. The acoustic system as claimed in claim 3, wherein the locking member is an electromagnetic locking member, wherein the base device further comprises a control module connected to the electromagnetic lock, the control module is connected to the detecting module and is configured to enable a lock condition of the electromagnetic locking member when a connection condition of the detachable speaker and the base device is detected by the detecting module, wherein the base device is provided with an unlocking button connected to the control module, and wherein, when the unlocking button is pushed, the control module disables the lock condition of the electromagnetic locking member, whereby the detachable speaker is selectively detached from the base device.

5. The acoustic system as claimed in claim 3, wherein the locking member comprises: a first clamping portion having a first clamping groove; and a second clamping portion having a second clamping groove, the first clamping portion is adjacent to the second clamping portion, wherein an opening of the first clamping groove corresponds to an opening of the second clamping groove, wherein the first clamping portion and the second clamping portion are made of a magnetic material formed by induction, and the latching rod is made of a material of magnetic attraction, wherein, when the detachable speaker is selectively joined to the base device, the latching rod is latched by the first clamping groove and the second clamping groove, and wherein when a connection condition of the detachable speaker and the base device is detected by the detecting module, the first clamping portion and the second clamping portion are magnetized to attract the latching rod, thereby constraining the latching rod between the first clamping groove and the second clamping groove.

6. The acoustic system as claimed in claim 3, wherein the detecting module is mounted to a lateral wall of the accommodating groove and the detecting module comprises a distance sensor or a pressure sensor, wherein a wireless connection between the communication module and an electronic device is established when the disconnection of the detachable speaker and the base device is detected by the detecting module, whereby the detachable speaker produces sound according to audio signals generated by the electronic device and transmitted through the communication module when the acoustic system is deactivated, and wherein the detachable speaker produces sound according to audio signals generated by the acoustic system through the wired connection of the connection module and the communication module when a connection of the detachable speaker and the base device is detected by the detecting module.

7. The acoustic system as claimed in claim 3, wherein the positioning member is connected to the detecting module, wherein at least a portion of the positioning member is made of a magnetic material formed by electromagnetic control, wherein at least a portion of the positioning groove is made of a material of magnetic attraction and corresponding to at least a portion of the positioning member, and wherein, when a connection of the detachable speaker and the base device is detected by the detecting module, the at least a portion of the positioning member controlled by the

detecting module generates a magnetic field to attract the at least a portion of the positioning groove to secure the positioning member in the positioning groove.

8. The acoustic system as claimed in claim 3, wherein the locking member comprises: a first clamping portion having a first clamping groove; and a second clamping portion having a second clamping groove, the first clamping portion is adjacent to the second clamping portion, wherein an opening of the first clamping groove corresponds to an opening of the second clamping groove, wherein the first clamping portion is made of a magnetic material formed by induction, and the second clamping portion is made of a material of magnetic attraction, wherein, when the detachable speaker is selectively joined to the base device, the latching rod is latched by the first clamping groove and the second clamping groove, and wherein, when a connection condition of the detachable speaker and the base device is detected by the detecting module, the first clamping portion attracts the second clamping portion, thereby constraining the latching rod between the first clamping groove and the second clamping groove.

9. The acoustic system as claimed in claim 1, wherein the second housing comprises: a main body; a first protrusion portion; and a second protrusion portion, wherein the first protrusion portion and the second protrusion portion are disposed at two ends of the main body to constitute the accommodating groove, a bottom of which is located on the main body.

10. The acoustic system as claimed in claim 9, wherein the second housing has a U-shaped structure, and wherein the accommodating groove is a central depression of the second housing.

11. The acoustic system as claimed in claim 9, wherein the positioning member is disposed on the first protrusion portion and the locking member is disposed on the main body.

12. The acoustic system as claimed in claim 9, wherein the positioning member is disposed on the second protrusion portion, wherein the locking member is disposed on the main body, and wherein the locking member is in proximity to the first protrusion portion or the second protrusion portion.

13. The acoustic system as claimed in claim 9, wherein the locking member is disposed on the main body, wherein the base device comprises two the positioning members, wherein the detachable speaker comprises two the positioning grooves, wherein the two positioning members are disposed on the first protrusion portion and the second protrusion portion respectively, and wherein the two positioning grooves are located corresponding to the two positioning members, whereby the positioning discs of the positioning members are joined to the two positioning grooves when the detachable speaker is selectively joined to the base device.

14. The acoustic system as claimed in claim 1, wherein the positioning member further comprises a positioning base, one end of the positioning base being connected to the second housing, wherein the positioning disc is disposed at another end of the positioning base, and the positioning groove comprises a mounting groove and a limiting groove formed on a lateral wall of the mounting groove, whereby the positioning disc moves into the limiting groove along the limiting groove, the positioning base is accommodated in the mounting groove, and the positioning disc is tightly fitted to the limiting groove when the detachable speaker is selectively joined to the base device.

15. The acoustic system as claimed in claim 14, wherein the mounting groove is a U-shaped groove or a V-shaped groove, wherein the positioning groove has a profile corresponding to that of the mounting groove, and wherein the positioning disc has a horizontal cross section greater than that of the positioning base.

16. The acoustic system as claimed in claim 14, wherein the positioning disc is made of silicon rubber or the positioning disc has a peripheral portion made of a material comprising silicon rubber.

17. The acoustic system as claimed in claim 1, wherein the accommodating groove has a volume substantially identical to that of the detachable speaker, whereby the detachable speaker is tightly fitted into the accommodating groove when the detachable speaker is selectively joined to the base device.

18. The acoustic system as claimed in claim 1, wherein the detachable speaker further comprises a rechargeable battery disposed in the first housing and providing electrical power to the detachable

speaker, wherein the base device further comprises a wireless charging module disposed in the second housing and connected to the detecting module, and wherein the wireless charging module is located in a position corresponding to the rechargeable battery, whereby the wireless charging module charges the rechargeable battery when the detachable speaker is selectively joined to the base device.

19. The acoustic system as claimed in claim 1, wherein the accommodating groove has a first lateral wall, a second lateral wall and a third lateral wall, the first lateral wall, the second lateral wall and the third lateral wall cover a top surface, a lateral surface and a bottom surface of the detachable speaker respectively.

20. The acoustic system as claimed in claim 1, wherein the detachable speaker further comprises a rechargeable battery disposed in the first housing, the first housing has a first electrode and a second electrode exposed externally, the first electrode and the second electrode are connected to the rechargeable battery providing electrical power to the detachable speaker, wherein the base device further comprises a power conversion module disposed in the second housing and a first spring electrode and a second spring electrode connected to the power conversion module, and wherein, when the detachable speaker is selectively joined to the base device, the first electrode presses the first spring electrode and the second electrode presses the second spring electrode, whereby the power conversion module charges the rechargeable battery.
