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(54) **ACOUSTIC SPACE BUILDING STRUCTURE CAPABLE OF AMPLIFYING SOUND AND PRODUCING OPTIMAL REVERBERANT SOUND BY MEANS OF SOUND FOCUSING WITHOUT SOUND EQUIPMENT**

AKUSTISCHE RAUMBAUSTRUKTUR ZUR KLANGVERSTÄRKUNG UND ERZEUGUNG EINES OPTIMALEN HALLKLANGS MITTELS KLANGFOKUSSIERUNG OHNE KLANGAUSRÜSTUNG

STRUCTURE DE CONSTRUCTION D'ESPACE ACOUSTIQUE CAPABLE D'AMPLIFIER LE SON ET DE PRODUIRE UN SON RÉVERBÉRANT OPTIMAL AU MOYEN D'UNE FOCALISATION SONORE SANS ÉQUIPEMENT SONORE

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Description

FIELD

[0001] The present disclosure relates to a building structure having a space having an open top in a central area in a building plan view, wherein when outdoor events such as music performance, speeches, and weddings are held in the space having the open top, a sound generated from a central stage is amplified by itself via sound focusing and resonance caused by structural characteristics of the building, so that an audience or a viewer can listen to a pure original sound at a satisfactory volume without separate loudspeaker equipment such as speakers or amplifiers, and in addition, in terms of sound quality, sound reflection, sound absorption, and sound interference are in an appropriate harmony with each other such that clear and transparent optimal reverberation sound can be generated.

DESCRIPTION OF RELATED ART

[0002] Recently, various kinds of events that have been held in indoor performance venues, for example, events such as music concerts, weddings, cultural events, lectures, and speeches are held outdoors in order to pursue a sense of openness, a unique feeling, and a free atmosphere. In the performance event held outdoors, there are advantages such as creating a free atmosphere and providing the audience a unique and fresh feeling because the behavior of the audience is not constrained. However, basically, the outdoor event is very sensitive to the influence of weather and climate. Further, unlike in a spatially closed room, the sound spreads to an open outside space outdoors, resulting in large sound loss and poor sound transmission to the audience.

[0003] In particular, the disadvantages in terms of sound quality as the problem in the outdoor performance will be more specifically discussed. In the indoor performance, the sound generated on the stage is reflected from the wall, the ceiling, and the floor, and then, the reflected sounds resonate in the enclosed indoor space to generate a reverberation sound. Thus, the audience may feel a sense of sound fullness and a space feeling. However, in the outdoor performance, the sound generated on the stage may not be reflected but may be diffused to the open outside, so that the sound loss is great, thus making it difficult for the audience to enjoy the sound at a sufficient volume. Further, the sound does not resonate outdoors, such that the audience may hear a poor and dry sound. Further, the performer has to perform the performance while listening to his own performance during the performance. However, in the outdoor performance, it is very difficult for the performer to monitor such performance because the sound of his performance or singing cannot be transmitted to the performer in a form of the reflected sound. Further, the surrounding noises may be transmitted to the performer to distract the performer. This reduc-

es the performer's concentration and causes high-level performance not to be conducted.

[0004] Therefore, conventionally, in the outdoor performance, separate sound equipment such as a speaker and an amplifier is required so that the audience can hear the stage performance sound at a sufficient volume. Accordingly, a lot of time, a cost, and effort are required for pre-installation and uninstallation of the sound equipment as described above. In addition, there is a disadvantage in that the satisfaction of the audience decreases because the audience listen to the sound coming out through the speaker rather than enjoying the stage performance sound as it is.

[0005] Further, in the indoor performance, the audience may hear the reflected sound and the reverberation sound from the wall, the floor, the ceiling, etc. along with the stage original sound, and thus may get a three-dimensional and rich feeling in terms of sound. As described above, in hearing the performance via the sound equipment such as the speaker installed at a certain location, there is a limitation that the sound is delivered in a two-dimensional and dry feeling compared to the above indoor performance. Conventionally, in addition to the main speaker, a number of separate surround speakers are placed along an outer periphery of the performance field to artificially generate effects similar to the reflected sound and the reverberation sound in the indoor performance. Representative examples of a prior art employing the number of separate surround speakers are placed along an outer periphery of the performance field include Korean utility model registration Nos. 20-0295451 and 20-0316692.

[0006] The above registered utility models relate to an outdoor reverberation sound inducing system and speaker device. As shown in the drawing shown in FIG. 6, in the registered utility models, a main speaker that outputs a direct sound, a number of initial reflected sound speakers and a number of reverberation sound speakers are arranged so as to surround the outdoor performance field. This may generate an effect similar to that of artificially installing a reflective wall around the performance field, and may obtain a sense of space felt due to the reflected sound and the reverberation sound in the indoor performance field.

[0007] However, according to the prior art as described above, a cost required for performance greatly increases due to the additional installation of these speakers. The installation and removal of the sound equipment by skilled technicians is required in the outdoor performance. Not only does it take a lot of time and effort for performance preparation and cleanup, but also, in terms of sound, even when the reflected sound and reverberation sound effects are indirectly achieved through the installation of additional speakers, there is a limitation in generating the three-dimensional effect and lingering sound effect as in the indoor performance via the artificial effects using such speakers. WO 2017/105540 A1, US6915610B2 and CN206753133U disclose further

acoustic space building structures forming part of the state of the art.

DISCLOSURE

TECHNICAL PURPOSE

[0008] Therefore, a purpose of the present disclosure is to provide a building structure in which when events such as music performance, speeches, and weddings are held outdoors, a sound generated from a central stage is amplified by itself due to the structural characteristics of the building, so that an audience or viewer can listen to the sound at a satisfactory volume at a clear level comparable to that in an indoor performance, and thus events such as outdoor performance can be held without separate sound equipment such as speakers or amplifiers.

[0009] Further, another purpose of the present disclosure is to provide a building structure in which the audience can enjoy the performance with a pure original sound without using the sound equipment at the outdoor event as described above, thereby greatly increasing audience satisfaction, and in particular, in terms of sound quality, an appropriate harmony between sound reflection, sound absorption, and sound interference can be achieved to generate a clear and transparent optimal reverberation sound.

TECHNICAL SOLUTION

[0010] An acoustic space building structure according to the present disclosure to achieve the above purpose is installed on a base bottom face and has an open top, wherein the acoustic space building structure has one point on the base bottom face as a center point in a plan view thereof, wherein the acoustic space building structure comprises: a plurality of sound guide blade plates standing upright on the base bottom face and spaced from each other by a predefined spacing, wherein the plurality of sound guide blade plates extend radially toward the center point on the base bottom face and are spaced from the center point and are arranged in a curved frame shape in the plan view of the building structure; a sound reflective wall standing upright on the base bottom face and connected to the sound guide blade plates, wherein the sound reflective wall extends in a curved shape identical with the curved frame shape in the plan view of the building structure, wherein an acoustic space is defined so as to be surrounded with an inner side face of the sound reflective wall; and a rooftop viewing floor vertically spaced apart from the base bottom face by a predefined vertical dimension, wherein rooftop viewing floor extends from an outer side face of an upper portion of the sound reflective wall in a direction away from the center point in the plan view of the base bottom face.

[0011] In this regard, each of the sound guide blade plates is a columnar member extending vertically and

having a cross-sectional shape having a long side and a short side, wherein each of the sound guide blade plates has the long side extending radially toward the center point in the plan view of the base bottom face, wherein an entirety or a portion of a cross section of each of the sound guide blade plates protrudes, by a predefined length, from an inner side face of the sound reflective wall in a direction toward the center point in the plan view.

[0012] In this regard, the sound guide blade plates are spaced from the center point of the base bottom face by the same spacing, wherein in a top view of the building structure, the sound guide blade plates are arranged in a circular shape or an arc shape in which one portion of a full circle is open.

[0013] Further, the acoustic space building structure, each of the sound guide blade plates is made of a material having a higher sound absorption coefficient than a sound absorption coefficient of a material of the sound reflective wall. Alternatively, a sound absorbing finishing layer made of a material having a higher sound absorption coefficient than a sound absorption coefficient of the sound reflective wall plate is further formed on a surface of each of the sound guide blade plates.

[0014] Moreover, the acoustic space building structure further comprises a horizontal sound guide blade plate having the same cross-sectional shape as a cross-sectional shape of each of the sound guide blade plates, wherein the horizontal sound guide blade plate extends in a horizontal direction and along the arrangement of the sound guide blade plates.

TECHNICAL EFFECT

[0015] According to the sound space building structure according to the present disclosure as described above, when events such as music performance, speeches, and weddings are held outdoors, the sound generated from the central stage is amplified by itself via the sound focusing and resonance phenomenon caused by the structural characteristics of the building, so that the audience or spectators may listen to the sound at a clear level and a satisfactory volume comparable to those in the indoor performance. Accordingly, during the outdoor performance, the audience may enjoy the stage performance sound in a pure original sound state without separate sound equipment such as a speaker or amplifier, thereby greatly increasing the satisfaction of the audience.

[0016] Further, according to the sound space building structure according to the present disclosure as described above, in terms of sound quality, the audience may hear the stage original sound, the resonant sound, and the reverberation sound in a harmony with each other. Thus, the disadvantage of the outdoor performance that the sound sounds in a dry and poor manner may be overcome. Thus, as in the indoor performance, the audience may enjoy the sound at a three-dimensional, resonant, lingering, and rich manner. In addition, according to the preferred configuration of the present disclosure,

the sound reflection, the sound absorption, and the sound interference are properly harmonized with each other, so that appropriate resonance, and clear and transparent optimal reverberation sound may be generated.

[0017] Further, conventionally, the performance sound spreads to the open outside in the general outdoor performance. Thus, it is difficult for the central stage performer to monitor the performance thereof. However, according to the sound space building structure according to the present disclosure as described above, the central stage performer can monitor the performance thereof while listening to the own performance sound based on the reflected sound. In addition, the surrounding noise may be prevented from being transmitted to the performer due to the difference between the vertical levels of the stage where the performance is performed and the rooftop viewing floor. Thus, an effect of maintaining the concentration of the performer and an effect of maintaining a high level of performance may be expected.

BRIEF DESCRIPTION OF DRAWINGS

[0018]

FIG. 1 is a top plan view of an acoustic space building structure according to the present disclosure.

FIG. 2 is an elevational cross-sectional view of the acoustic space building structure according to the present disclosure as taken along a line A-A' of FIG. 1.

FIG. 3 is a perspective view of the acoustic space building structure according to the present disclosure as viewed toward one side.

FIG. 4 is a perspective view of the acoustic space building structure according to the present disclosure as viewed toward another side.

FIG. 5 is a schematic diagram showing a sound effect in the acoustic space building structure according to the present disclosure.

FIG. 6 is a speaker arrangement diagram in a conventional reverberation inducing system at an outdoor performance.

Reference numerals

[0019]

10: Sound guide blade plate 15: Horizontal sound guide blade plate

20: Sound reflective wall 30: Rooftop viewing floor

50: Sound source stage

100: Base bottom face 200: Acoustic space

S0: Stage original sound S1: Reflected sound

S2: Resonant sound

DETAILED DESCRIPTIONS

[0020] Hereinafter, the present disclosure will be described in more detail with reference to the accompanying drawings.

[0021] The present disclosure relates to a courtyard-type building structure in which a building structure is constructed on a ground such that a central area in a plan view of the building is free of a ceiling, and a top is open in the central area, and the building structure has a central space surrounded with a surrounding structure. In particular, in the building structure according to the present disclosure, the central space as the courtyard space having the open top may act as an acoustic space in which when outdoor music performance, performance of various types, etc. are held, the audience can feel a sense of space and a reverberation sound comparable to that of a performance in an indoor space without using separate sound equipment.

[0022] FIG. 1 is a top plan view of the acoustic space building structure according to the present disclosure as described above. FIG. 2 is an elevational cross-sectional view of the acoustic space building structure according to the present disclosure. As shown in FIGS. 1 and 2, the acoustic space building structure according to the present disclosure includes a plurality of sound guide blade plates 10 standing upright on the base bottom face 100 and arranged in a curved frame shape in a plan view and spaced from each other by a predefined spacing; a sound reflective wall 20 connected to the sound guide blade plate 10 and extending in a curved shape identical with the curved frame shape in a plan view, wherein a circular acoustic space 200 is surrounded with an inner side face thereof; and a rooftop viewing floor 30 positioned at a certain vertical level corresponding to a vertical level of a position belonging to an upper portion of each of the sound guide blade plate 10 and the sound reflective wall 20 and extending from the sound reflective wall 20 outwardly of a center point CP of the acoustic space 200. The acoustic space building structure according to the present disclosure further includes a sound source stage 50 installed on the base bottom face 100 and at a center of the acoustic space 200.

[0023] Further, according to an embodiment as shown in FIG. 1 and FIG. 2, in the acoustic space building structure according to the present disclosure, the sound guide blade plates 10 are installed on the base bottom face 100 and extend in a radial direction toward the center point CP in a plan view, and are spaced from the central point CP by a certain spacing. In this regard, the sound guide blade plates 10 are connected to the sound reflective wall 20 so as to protrude an inner side face of the sound

reflective wall 20 by a certain length inwardly (that is, toward the center point CP).

[0024] A more detailed description of each of the components constituting the acoustic space building structure according to the present disclosure having the above configuration will be set forth below with reference to the accompanying drawings.

[0025] First, each of the sound guide blade plates 10 is a columnar member standing upright and installed on the base bottom face 100. In the acoustic space building structure according to the present disclosure, the plurality of sound guide blade plates 10 are installed on the base bottom face 100 and are spaced from each other by a certain spacing as shown in FIGS. 1 and 2. In this regard, the plurality of sound guide blade plates 10 are arranged in the curved frame shape in a plan view as shown in FIG. 1 and extend radially toward the center point CP and are spaced, by a certain distance, from the center point CP as one point on the base bottom face 100.

[0026] Further, as shown in FIG. 1 and FIG. 2, the sound guide blade plate 10 is a columnar member having a uniform cross-section shape and extending vertically in an elongate manner. In this regard, the cross-sectional shape of the sound guide blade plate 10 is a rectangular column shape having a long side and a short side, wherein a direction in which the long side extends is the radial direction toward the center point CP. That is, the sound guide blade plates 10 radially extend toward the center point CP in the plan view of the base bottom face. That is, as described in more detail with reference to effects of the present disclosure as described later, the sound generated from the sound source stage 50 at the central point is reflected from the sound reflective wall 20 and then the reflected sounds are concentrated on the central area such that resonance occurs (in the present disclosure, the amplification effect induced by concentrating the reflected sounds on the central area is referred to as a sound focusing action). Thus, a resulting sound of a large volume can be acquired without separate sound equipment. In accordance with the present disclosure, as described above, each of the sound guide blade plates 10 is oriented toward the center point CP to allow diffusely reflected sounds to be directed in a uniform direction, and allow the reflected sounds to be concentrated onto the central area, so that the sound focusing action as described above may occur smoothly.

[0027] In one example, according to an embodiment shown in FIG. 1 and FIG. 2, the sound guide blade plates 10 as described above are installed on the base bottom face 100. In this regard, the sound guide blade plates 10 are spaced from the center point CP in the plan view of the base bottom face 100 by a uniform spacing, and thus are arranged in an arc shape having an open portion in a top view. That is, according to the main technical features of the present disclosure, as will be described later, the sound reflective wall 20 is connected to the sound guide blade plates 10 so that the sound generated inside the acoustic space 200 is reflected from the sound re-

fective wall 20 and then returns to the sound source stage 50. However, if, unlike the embodiment as shown in FIG. 1, respective distances between the respective sound guide blade plates 10 and the center point CP in the plan view of the sound guide blade plate 10 are not uniform, a difference between times when the reflected sounds from the sound reflective wall 20 respectively propagate by the sound guide blade plates 10 and reach the center point CP may occur. Thus, the reflected sounds carrying the same content reach the center point continuously in different directions at different times in a relay manner. Thus, a performer performing on the sound source stage 50 may hear the reflected sounds in a form of an echo.

[0028] Therefore, as shown in the embodiment as shown in FIG. 1, in order to prevent the player's confusion due to the fact that the reflected sounds reach the center point continuously in different directions at different times as described above, the respective distances between the respective sound guide blade plates 10 and the center point CP are substantially equal to each other and the sound guide blade plates 10 are arranged in a circular manner. However, in another implementation having the above disadvantage to some extent, the sound guide blade plates 10 may be arranged in another curved shape such as an oval rather than a circle or an arc. This embodiment should also be understood as belonging to the technical scope of the present disclosure as basically not departing from the technical spirit of the present disclosure.

[0029] FIG. 1 refers to an example in which the sound guide blade plates 10 as described above are arranged in the arc manner in which a lower portion of a circular shape corresponding to an arc of 90 degrees is open. As shown in FIG. 1, when the sound guide blade plates 10 are arranged in the arc manner in which a lower portion of a circular shape corresponding to an arc of a predefined angle is open in the plan view, the predefined angle may not exceed 120 degrees. When the predefined angle exceeds 120 degrees (for example, the predefined angle is 180 degrees), the sound focusing effect corresponding to the main technical feature of the present disclosure may not be sufficiently achieved.

[0030] In addition, in implementing the sound guide blade plates 10 according to the structural characteristics of the present disclosure, it is more preferable that each of the sound guide blade plates 10 is made of a material having a higher sound absorption coefficient in terms of sound absorption performance than that of a material of the sound reflective wall 20 as described later. That is, as described above, in accordance with the present disclosure, the sound guide blade plates 10 are configured to concentrate the sounds reflected from the sound reflective wall 20 in the direction toward the center point to induce the sound focusing phenomenon. In this regard, when the sound reflection is excessive, the audience may feel somewhat resonant and coarse sound in terms of sound quality. Therefore, to solve this problem, in ac-

cordance with the present disclosure, the sound guide blade plate 10 has the higher sound absorption coefficient than that of the sound reflective wall 20 as described above. Thus, the sound guide blade plate 10 may absorb a partial amount of the original sound to adjust a level of the reflected sound. According to the preferred configuration of the present disclosure, the building structure according to the present disclosure may be expected to produce an optimal reverberation sound via appropriate harmony between sound absorption and sound reflection. In one example, in addition to the above configuration, it is also practical to form a sound absorption finish layer (not shown) by further attaching or coating a material having a high sound absorption coefficient on a surface of the sound guide blade plate 10.

[0031] According to the preferred configuration of the present disclosure as described above, the sound guide blade plate 10 may be made of a wood material having the sound absorption performance to some extent. Basically, a wooden pillar may be used as the sound guide blade plate 10. Alternatively, the sound guide blade plate 10 may be formed by attaching a wooden panel to a surface of a pillar member made of other materials, such as a metal polygonal pipe. Further, the wood has the sound absorption coefficient in a range of about 5 to 10%, depending on a frequency. That is, the sound absorption coefficient of the wood is not high. Since the sound absorption coefficient increases significantly as the number of empty spaces inside the member increases, the sound absorption coefficient may be appropriately adjusted as needed via adjustment of a space occupancy percentage inside the wooden member.

[0032] In this regard, the wooden pillar or the wooden panel is installed outdoors. Thus, it is more preferable that the wooden pillar or the wooden panel is treated with a preservative and includes a deformation-completed wood. Further, according to the present disclosure, the sound guide blade plate 10 may be not only made of the wood-based material as described above, but also formed by, for example, by attaching, coating, painting, or spraying a sound-absorbing material to a surface of a metal polygonal pipe. Alternatively, the sound guide blade plate 10 may be made of a synthetic resin, or may be embodied as a precast concrete member, or may be constructed using other construction methods such as concrete pouring and molding. This is selected by those skilled in the art.

[0033] In one example, according to the present disclosure, as shown in FIG. 1, the sound guide blade plate 10 is configured to protrude, by a certain length, from the inner side surface of the sound reflective wall 20 inwardly, that is, in a direction toward the center point CP in a plan view. This is one of the structural features considered in the present disclosure to induce the sound focusing phenomenon as a major technical effect of the present disclosure. That is, when the sound is reflected on the surface of the sound reflective wall 20, a certain portion of the sound is substantially diffusely reflected from the sur-

face of the sound reflective wall 20. Accordingly, the reflected sounds may be dispersed and may not sufficiently return to the center stage. Thus, in accordance with the present disclosure, in installing and configuring the sound guide blade plate 10 as described above, the sound guide blade plate 10 protrudes, by a certain length, from the inner side surface of the sound reflective wall 20 toward the center stage. Thus, the sounds reflected from the sound reflective wall 20 may be guided and concentrated to the center, thereby inducing the sound focusing action. According to the technical characteristics of the present disclosure, the sound guide blade plate 10 should protrude from the inner side face of the wall 20 by a sufficient length so that the above sound focusing action may occur smoothly. The protruding length should basically be at least 8 cm, and preferably 15 to 30 cm. However, when the protruding length of the sound guide blade plate 10 is smaller than 8 cm, it is difficult to expect the sound focusing action, which is not preferable. However, when the protruding length is slightly larger than 30 cm, the length may be adjusted to some extent such that there is no problem in space design and construction.

[0034] Furthermore, as shown in the preferred embodiment shown in FIG. 1 and FIG. 2, a horizontal sound guide blade plate 15 in addition to the sound guide blade plate 10 extending in the vertical direction may be further installed in the acoustic space architecture of the present disclosure. The horizontal sound guide blade plate 15 may extend horizontally and in a parallel manner to the base bottom face 100 and may extend in the same arc manner as the arc manner in which the sound guide blade plates 10 as described above are arranged in the plan view.

[0035] In this regard, the horizontal sound guide blade plate 15 is also a key component that allows the sound focusing action to be performed more smoothly in accordance with the present disclosure. Adding the horizontal sound guide blade plate 15 may prevent the sound from spreading upwardly and being dispersed, so that the sound focusing action of the present disclosure may be further strengthened. Further, the reflected sound propagating upwards may be blocked and guided to the center stage in the central area under the action of the horizontal sound guide blade plate 15 as described above. Thus, the performer playing in the sound source stage 50 of the central area may be able to monitor the own performance while listening to the own performance. A vertical level of the horizontal sound guide blade plate 15 may correspond to approximately 1/2 of an entire vertical dimension of the sound guide blade plate 10. The vertical level of the horizontal sound guide blade plate 15 may slightly vary depending on an entire vertical dimension of each of the sound guide blade plate 10 and the sound reflective wall 20 and a distance thereof from the center point.

[0036] Next, the sound reflective wall 20 is a wall-type structure having a constant thickness. As shown in FIG. 1 and FIG. 2, the sound reflective wall 20 is connected

to an outer side face of each of the sound guide blade plates 10 and stands upright on the base bottom face 100. As shown in FIG. 1, the sound reflective wall 20 may extend in an arc-shaped curved shape in the same way as the sound guide blade plates 10 are arranged in the plan view. Accordingly, the inner side surface of the sound reflective wall 20 is perpendicular to a direction toward the arc center point CP, so that the sound incident from the arc center point CP of the central area may be reflected from the sound reflective wall 20 and then may return to the central stage 50.

[0037] As described above, in accordance with the present disclosure, the sound reflective wall 20 reflects the sound to cause self-amplification of the sound via a resonance phenomenon. The combination of the sound reflective wall 20 and the above-mentioned sound guide blade plates 10 may act as a key component that generates the sound focusing action according to the present disclosure.

[0038] The sound reflective wall 20 as described above may be composed of a member with a high sound reflectance while having a smooth surface so that the incident sound thereto may be reflected therefrom and may return to the sound source stage as it is. A glass panel may be most suitably used as a material of the sound reflective wall 20. Alternatively, the sound reflective wall 20 may include a metal panel made of aluminum, a synthetic resin panel, a smooth surface-treated marble, or a smooth exposed concrete. The sound reflective wall 20 may include a combination of at least two of the above members, for example, a combination of a glass panel and an aluminum panel.

[0039] In one example, according to the embodiment as shown in FIG. 1 and FIG. 2, the sound guide blade plate 10 and the sound reflective wall 20 may be combined with each other as follows. The sound reflective wall 20 may be constructed as an integral wall. The sound guide blade plates 10 as separate members may be attached to the inner side surface of the sound reflective wall 20. However, the present disclosure is not limited thereto. In another example, each of the sound guide blade plates 10 may be embodied as a window frame and then a separate glass panel may be fixedly fitted into a space between the sound guide blade plates 10.

[0040] The sound guide blade plate 10 and the sound reflective wall 20 as combined with each other as described above constitute a circular wall structure, as shown in the embodiment shown in FIG. 1 and FIG. 2. The acoustic space 200 in a form of a courtyard space may be defined so as to be surrounded with the circular wall structure. Further, as in the illustrated embodiment, the sound source stage 50 may be installed in the central area of the acoustic space 200 in the plan view. The sound generated from the performance on the sound source stage 50 may be self-amplified via sound reflection from the sound reflective wall 20 and concentration induction by the sound guide blade plate 10 as described above. Thus, even without the separate sound equip-

ment, the building structure can generate an enough volume for the audience on the rooftop viewing floor 30 to enjoy.

[0041] As shown in FIG. 1 and FIG. 2, the rooftop viewing floor 30 is a ceiling structure extending horizontally from the upper portion of the sound reflective wall 20 in an outward direction. An indoor space may be defined below the rooftop viewing floor 30. The audience may be positioned on a top face of the rooftop viewing floor 30 and may enjoy the performance in the acoustic space 200 in which the above-mentioned sound source stage 50 is installed. According to the illustrated embodiment, the rooftop viewing floor 30 extends horizontally and has a vertical level slightly lower than a vertical level of a top of the sound reflective wall 20, so that the vertical dimension of each of the sound reflective wall 20 and the sound guide blade plate 10 is maximized. However, the present disclosure is not limited thereto. The rooftop viewing floor 30 may extend horizontally from the top level of the sound reflective wall 20 and safety facilities such as safety handrails (not shown) may be installed on the rooftop viewing floor 30. Further, according to FIG. 2, the rooftop viewing floor 30 extends in a parallel manner with a ground. In another example, the rooftop viewing floor 30 may extend in a somewhat inclined manner relative to the ground according to a specific implementation design.

[0042] FIG. 3 and FIG. 4 are diagrams showing an overall shape of the acoustic space building structure according to the present disclosure having the above configuration in a three-dimensional manner. As shown in FIG. 3 and FIG. 4, in the acoustic space building structure according to the present disclosure, the building structure is spaced from, by a constant distance, from the arc center so that a circular courtyard-shaped space with an open top is formed in the central area in the plan view. In this regard, as described above, in the acoustic space building structure according to the present disclosure, the courtyard space is defined by a wall structure formed by combining the plurality of sound guide blade plates and the sound reflective wall to each other. The circular acoustic space with an open top is defined in the central area of the plan view by the sound guide blade plates and the sound reflective wall. In FIG. 3 and FIG. 4, the reference numerals are omitted to prevent congestion on the drawing.

[0043] In the specific implementation of the acoustic space building structure according to the present disclosure, the distance from the arc center to each of the sound guide blade plates and the sound reflective wall, that is, the arc radius, is preferably in a range of about 15 to 35 m. This distance range is set based on a distance between the sound source stage of the central area to the audience on a top face of the rooftop viewing floor, a time for which the sound hits the sound reflective wall and returns to the center, and a distance at which the resonance phenomenon due to the harmony between the original sound and the reflected sound may occur smoothly. In this regard, the distance in a range of 15 to

25 m distance is most appropriate to generate the optimal reverberation sound.

[0044] Further, the vertical dimension of each of the sound guide blade plate and the sound reflective wall structure may be determined in proportion to the distance from the arc center to the sound reflective wall, and may be in a range of approximately 3 to 8 m.

[0045] Hereinafter, the sound effect due to the sound focusing phenomenon occurring in the acoustic space building structure according to the present disclosure will be described in more detail with reference to the accompanying drawings. FIG. 5 is a schematic diagram showing a sound effect in an acoustic space building structure according to the present disclosure. Referring to FIG. 5, an action related to the sound effect of the present disclosure will be described.

[0046] As described above, according to the present disclosure, the acoustic space 200 is defined in the central area in the plan view of the building so as to be surrounded with the sound reflective wall 20 and the sound guide blade plates 10. When an outdoor event such as a music performance is held within the acoustic space 200, the sound generated from the central stage is amplified by itself via the sound focusing and resonance caused by the configuration of the sound guide blade plates 10 and the sound reflective wall 20. Thus, the audience on a top face of the rooftop viewing floor 30 can listen to pure original sound at a satisfactory volume without the separate loudspeaker equipment such as the speaker or the amplifier.

[0047] More specifically, when the sound resulting from the performance is generated in the acoustic space 200 surrounded with the sound guide blade plates 10 and the sound reflective wall 20, the original sound S0 resulting from the performance is diffused, and hits the sound reflective wall 20 and then is reflected therefrom, such that the reflected sound S1 occurs. In this regard, the sound reflective wall 20 extends in a circle in a plan view having the center point CP on the base bottom face 100 as the arc center as shown in FIG. 1. Thus, the reflected sound S1 basically returns toward the stage center where the original sound S0 is generated.

[0048] As described above, when the stage original sound S0 is reflected from the sound reflective wall 20, not all of the reflected sounds S1 reflected from the sound reflective wall 20 return exactly to the stage center though the sound reflective wall 20 is made of a smooth surface suitable for sound reflection. In practice, diffused reflection partially occurs on the surface of the sound reflective wall 20, resulting in dispersion of the reflected sounds. In this regard, in accordance with the present disclosure, as described above, the sound guide blade plates 10 protrude, by the same predefined length, from the sound reflective wall 20. Thus, the reflected sounds diffusely reflected from the surface of the sound reflective wall 20 may be guided by the sound guide blade plates 10 in the protruding direction thereof. Thus, the dispersion of the reflected sounds S1 may be blocked such that the re-

flected sounds S1 may be concentrated toward the stage center (in accordance with the present disclosure, the action of concentrating the reflected sounds onto the central area is referred to as the sound focusing action).

[0049] Due to the sound focusing action as a major technical feature of the present disclosure, the reflected sounds S1 concentrated onto the stage central area as described above encounter the stage original sound S0 and the reflected sounds coming in different directions, such that interference and resonance therebetween occur. Thus, the resonant sound S2 is generated. The resonant sound S2 propagates upwardly of the acoustic space 200 and reaches the audience present on the rooftop viewing floor 30 extending outwardly from the upper portion of the sound reflective wall 20. Therefore, the audience on the rooftop viewing floor 30 may hear the resonant sound S2 and the reverberation sound generated via the sound reflection and resonance inside the acoustic space 200 together with the direct stage original sound S0. Thus, the audience is able to appreciate the performance based on a three-dimensional, reverberant, and rich sound as in the indoor performance,

[0050] Further, according to the present disclosure as described above, unlike the existing outdoor performance which requires the separate amplification device due to large volume loss resulting from the stage original sound spreading to the outside, the building structure according to the present disclosure is constructed such that the stage original sound S0 is not immediately diffused to the outside, but is reflected from the sound reflective wall 20, thereby generating the resonant sound S2 inside the acoustic space 200, which in turn is delivered to the audience. Thus, the sound energy loss may be greatly reduced. Therefore, according to the acoustic space building structure according to the present disclosure, a sufficient volume may be obtained without the sound equipment such as a speaker, so that the audience may enjoy the pure original sound of the stage performance sound.

[0051] That is, as shown in FIG. 2 and FIG. 5 as described above, according to the acoustic space building structure according to the present disclosure, the acoustic space 200 surrounded with the sound reflective wall 20 is positioned at a vertical level lower than that of the rooftop viewing floor 30 where the audience views the performance. The acoustic space 200 in accordance with the present disclosure may function as a resonator chamber of a musical instrument to act to amplify the original sound of the stage loudly so that the audience on the rooftop viewing floor 30 can hear the sound. Therefore, when the performance sound occurs from the sound source stage 50 of the central area, the performance sound is trapped in the above-mentioned acoustic space 200 and does not escape immediately. Further, as the performance sound is reflected several times from the sound reflective wall 20, the sound is amplified to a loud sound based on the sound interference and resonance phenomenon, and is transmitted to the audience on the

rooftop viewing floor 30 located above the acoustic space 200. In addition, as the reverberation sound generated due to the repeated sound reflections is continuously transmitted to the audience, the audience can hear the soundly clear and three-dimensional sound in a pure original sound state without using the sound equipment.

[0052] In relation to the reverberation sound as described above, in general, the reverberation sound may be composed of only the reflected sound because of little absorption of the original sound when the sound is reflected. In this case, the reverberation sound is very resonant, and a reverberation time is prolonged, such that an echo phenomenon (a cave effect) may occur. Therefore, in order to solve this problem, according to the present disclosure, each of the sound guide blade plates 10 connected to the sound reflective wall 20 from which the sound is reflected as described above has the sound absorption ability. Thus, the sound absorption and the sound reflection may be controlled to produce optimal reverberation sound.

[0053] That is, according to the preferred configuration of the present disclosure as described above, the sound guide blade plate 10 is made of a material having a higher sound absorption coefficient than that of the sound reflective wall 20. Alternatively, a sound absorbing finishing layer made of a sound absorbing finishing material may be attached or coated to or on the surface of the sound guide blade plate 10. Thus, when the stage original sound S0 hits the sound reflective wall 20 and is reflected therefrom, a portion of the sound is absorbed by the sound guide blade plates 10 and then a remaining portion of the sound except for the portion absorbed by the sound guide blade plates 10 may return to the center point. Thus, the sound absorption ability of the sound guide blade plate 10 as described above may be controlled such that an intensity of the reflected sound S 1 may be appropriately adjusted to allow the reverberation sound to be optimal.

[0054] Therefore, according to the technical characteristics of the present disclosure as described above, in an event such as a music performance in an open outdoor space, the sound generated from the central stage is amplified by itself based on the sound focusing action and the sound resonance. Thus, without the separate loudspeaker equipment such as the speaker or the amplifier, the audience can listen to the pure original sound at a satisfactory volume level. In addition, in terms of sound quality, the building structure according to the present disclosure may overcome the dry and poor sound as a disadvantage of the outdoor performance such that the audience may enjoy the sound with a three-dimensional and rich feeling as in the indoor performance. In addition, the building structure according to the present disclosure may achieve an appropriate harmony between the sound reflection, the sound absorption, and the sound interference to generate an appropriate resonance and a clear and transparent optimal reverberation sound.

[0055] The present disclosure has been described above in detail with reference to the described embodiments. However, those with ordinary knowledge in the technical field to which the present disclosure belongs will be able to make various substitutions, additions, and modifications within the range that does not deviate from the technical idea as described above. Thus, it should be understood that the modified embodiments also belong to the protection scope of the present disclosure defined by the appended claims below.

INDUSTRIAL APPLICABILITY

[0056] The present disclosure is related to the field of building and construction, and is applicable to the design and construction of a building structure.

Claims

1. An acoustic space building structure installed on a base bottom face (100) and having an open top,

wherein the acoustic space building structure has one point on the base bottom face as a center point in a plan view thereof, wherein the acoustic space building structure comprises:

a plurality of sound guide blade plates (10) standing upright on the base bottom face and spaced from each other by a predefined spacing, wherein the plurality of sound guide blade plates extend radially toward the center point on the base bottom face and are spaced from the center point and are arranged in a curved frame shape in the plan view of the building structure; a sound reflective wall (20) standing upright on the base bottom face and connected to the sound guide blade plates, wherein the sound reflective wall extends in a curved shape identical with the curved frame shape in the plan view of the building structure, wherein an acoustic space is defined so as to be surrounded with an inner side face of the sound reflective wall; and a rooftop viewing floor (30) vertically spaced apart from the base bottom face by a predefined vertical dimension, wherein rooftop viewing floor extends from an outer side face of an upper portion of the sound reflective wall in a direction away from the center point in the plan view of the base bottom face, wherein each of the sound guide blade plates is a columnar member extending vertically and having a cross-sectional shape

- having a long side and a short side,
 wherein each of the sound guide blade
 plates has the long side extending radially
 toward the center point in the plan view of
 the base bottom face,
 wherein an entirety or a portion of a cross
 section of each of the sound guide blade
 plates protrudes, by a predefined length,
 from an inner side face of the sound reflect-
 ive wall in a direction toward the center
 point in the plan view.
2. The acoustic space building structure of claim 1, fur-
 ther comprising a sound source stage (50) installed
 on the center point of the base bottom face
3. The acoustic space building structure of claim 1,
 wherein the sound guide blade plates are spaced
 from the center point of the base bottom face by the
 same spacing,
 wherein in a top view of the building structure, the
 sound guide blade plates are arranged in a circular
 shape or an arc shape in which one portion of a full
 circle is open.
4. The acoustic space building structure of claim 1,
 wherein each of the sound guide blade plates is
 made of a material having a higher sound absorption
 coefficient than a sound absorption coefficient of a
 material of the sound reflective wall.
5. The acoustic space building structure of claim 1,
 wherein a sound absorbing finishing layer made of
 a material having a higher sound absorption coeffi-
 cient than a sound absorption coefficient of the
 sound reflective wall plate is further formed on a sur-
 face of each of the sound guide blade plates.
6. The acoustic space building structure of claim 1,
 wherein the sound guide blade plate is entirely made
 of a wood or is formed by attaching a plate made of
 wood to a surface of a body plate thereof,
 wherein the sound reflective wall is embodied as a
 glass panel.
7. The acoustic space building structure of one of
 claims 1 to 6, further comprising a horizontal sound
 guide blade plate having the same cross-sectional
 shape as a cross-sectional shape of each of the
 sound guide blade plates, wherein the horizontal
 sound guide blade plate extends in a horizontal di-
 rection and along the arrangement of the sound
 guide blade plates.
8. The acoustic space building structure of one of
 claims 1 to 6, wherein a portion of the cross section
 of each of the sound guide blade plates protrudes
 from an inner side surface of the sound reflective

wall by a protruding length in a range of 8 to 30 cm.

9. The acoustic space building structure of claim 3,
 wherein the sound guide blade plates are arranged
 in an arc shape in which one portion of a circle is
 open by a predefined angle range in the plan view,
 wherein the predefined angle range is in a range of
 0° to 120°.

10. The acoustic space building structure of one of
 claims 1 to 6, wherein a distance from center of the
 sound source stage to the sound reflective wall is in
 a range of 15 to 30 m,

wherein a vertical dimension of each of the
 sound guide blade plates is in a range of 3 to 8 m,
 wherein the protruding length of the portion of
 the cross section of the sound guide blade plate
 from the inner side surface of the sound reflect-
 ing wall plate is in a range of 8 to 30 cm.

Patentansprüche

1. Akustikraum-Gebäudestruktur, die auf einer Basis-
 bodenfläche (100) installiert ist und ein offenes Ober-
 teil aufweist,

wobei die Akustikraum-Gebäudestruktur in ei-
 ner Draufsicht davon einen Punkt auf der Basis-
 bodenfläche als einen zentralen Punkt aufweist,
 wobei die Akustikraum-Gebäudestruktur um-
 fasst:

eine Vielzahl von Schalleitlamellen (10),
 die auf der Basisbodenfläche aufrecht ste-
 hen und durch einen vordefinierten Abstand
 voneinander beabstandet sind, wobei in der
 Draufsicht der Gebäudestruktur sich die
 Vielzahl von Schalleitlamellen radial zu
 dem zentralen Punkt auf der Basisboden-
 fläche hin erstrecken und von dem zentra-
 len Punkt beabstandet sind und in Form ei-
 nes gebogenen Rahmens angeordnet sind;
 eine schallreflektierende Wand (20), die auf
 der Basisbodenfläche aufrecht steht und
 mit den Schalleitlamellen verbunden ist,
 wobei in der Draufsicht der Gebäudestruk-
 tur sich die schallreflektierende Wand in ei-
 ner gebogenen Form erstreckt, die iden-
 tisch zu der Form des gebogenen Rahmens
 ist, wobei ein akustischer Raum so definiert
 wird, dass er mit einer Innenseitenfläche
 der schallreflektierenden Wand umgeben
 ist; und
 eine Dachterrassenaussichtsebene (30),
 die durch eine vordefinierte vertikale Ab-
 messung von der Basisbodenfläche vertikal

- beabstandet ist, wobei in der Draufsicht der Basisbodenfläche sich die Dachterrassen- aussichtsebene von einer Außenseitenfläche eines oberen Teils der schallreflektierenden Wand in einer Richtung weg von dem zentralen Punkt erstreckt, wobei jede der Schallleitlamellen ein säulenförmiges Element ist, das sich vertikal erstreckt und eine Querschnittsform mit einer langen Seite und einer kurzen Seite aufweist, wobei jede der Schallleitlamellen die lange Seite aufweist, die in der Draufsicht der Basisbodenfläche sich radial zu dem zentralen Punkt erstreckt, wobei eine Gesamtheit oder ein Teil eines Querschnitts von jeder der Schallleitlamellen in der Draufsicht, um eine vordefinierte Länge, von einer Innenseitenfläche der schallreflektierenden Wand in einer Richtung zu dem zentralen Punkt hin vorsteht.
2. Akustikraum-Gebäudestruktur nach Anspruch 1, ferner umfassend eine Schallquellenbühne (50), die an dem zentralen Punkt der Basisbodenfläche installiert ist.
3. Akustikraum-Gebäudestruktur nach Anspruch 1, wobei die Schallleitlamellen von dem zentralen Punkt der Basisbodenfläche durch den gleichen Abstand beabstandet sind, wobei in einer Draufsicht der Gebäudestruktur die Schallleitlamellen in einer kreisförmigen Form oder einer Bogenform angeordnet sind, bei der ein Teil eines vollen Kreises offen ist.
4. Akustikraum-Gebäudestruktur nach Anspruch 1, wobei jede der Schallleitlamellen aus einem Material hergestellt ist, das einen höheren Schallabsorptionskoeffizienten als ein Schallabsorptionskoeffizient eines Materials der schallreflektierenden Wand aufweist.
5. Akustikraum-Gebäudestruktur nach Anspruch 1, wobei eine schallabsorbierende Finishing-Schicht, die aus einem Material hergestellt ist, das einen höheren Schallabsorptionskoeffizienten als ein Schallabsorptionskoeffizient der schallreflektierenden Wandplatte aufweist, ferner auf einer Oberfläche von jeder der Schallleitlamellen gebildet ist.
6. Akustikraum-Gebäudestruktur nach Anspruch 1, wobei die Schallleitlamelle vollständig aus einem Holz hergestellt ist oder durch Anbringen einer aus Holz hergestellten Platte auf einer Oberfläche einer Körperplatte davon gebildet ist, wobei die schallreflektierende Wand als eine Glas-scheibe ausgeführt ist.
7. Akustikraum-Gebäudestruktur nach einem der Ansprüche 1 bis 6, ferner umfassend eine horizontale Schallleitlamelle, welche die gleiche Querschnittsform wie eine Querschnittsform von jeder der Schallleitlamellen aufweist, wobei sich die horizontale Schallleitlamelle in einer horizontalen Richtung und entlang der Anordnung der Schallleitlamellen erstreckt.
8. Akustikraum-Gebäudestruktur nach einem der Ansprüche 1 bis 6, wobei ein Teil des Querschnitts von jeder der Schallleitlamellen von einer Innenseitenoberfläche der schallreflektierenden Wand um eine vorstehende Länge in einem Bereich von 8 bis 30 cm vorsteht.
9. Akustikraum-Gebäudestruktur nach Anspruch 3, wobei die Schallleitlamellen in einer Bogenform angeordnet sind, bei der in der Draufsicht ein Teil eines Kreises um einen vordefinierten Winkelbereich offen ist, wobei der vordefinierte Winkelbereich in einem Bereich von 0° bis 120° ist.
10. Akustikraum-Gebäudestruktur nach einem der Ansprüche 1 bis 6, wobei ein Abstand von einem Zentrum der Schallquellenbühne zu der schallreflektierenden Wand in einem Bereich von 15 bis 30 m ist, wobei eine vertikale Abmessung von jeder der Schallleitlamellen in einem Bereich von 3 bis 8 m ist, wobei die vorstehende Länge des Teils des Querschnitts der Schallleitlamelle von der Innenseitenoberfläche der schallreflektierenden Wandplatte in einem Bereich von 8 bis 30 cm ist.

Revendications

1. Structure de bâtiment à espace acoustique installée sur une face inférieure de base (100) et présentant un sommet ouvert,

dans laquelle la structure de bâtiment à espace acoustique présente un point sur la face inférieure de base en tant que point central dans une vue en plan de celle-ci, dans laquelle la structure de bâtiment à espace acoustique comprend :

une pluralité de plaques de lames de guidage sonore (10) se tenant verticalement sur la face inférieure de base et espacées les unes des autres d'un espacement prédéfini, dans laquelle la pluralité de plaques de lames de guidage sonore s'étendent radialement vers le point central sur la face

- inférieure de base et sont espacées du point central et sont agencées dans une forme de cadre incurvé dans la vue en plan de la structure de bâtiment ;
une paroi de réflexion sonore (20) se tenant verticalement sur la face inférieure de base et reliée aux plaques de lames de guidage sonore, dans laquelle la paroi de réflexion sonore s'étend dans une forme incurvée identique à la forme de cadre incurvé dans la vue en plan de la structure de bâtiment, dans laquelle un espace acoustique est défini de manière à être entouré par une face latérale intérieure de la paroi de réflexion sonore ; et
un étage d'observation sur le toit (30) espacé verticalement de la face inférieure de base d'une dimension verticale prédéfinie, dans laquelle l'étage d'observation sur le toit s'étend depuis une face latérale extérieure d'une partie supérieure de la paroi de réflexion sonore dans une direction d'éloignement du point central dans la vue en plan de la face inférieure de base, dans laquelle chacune des plaques de lames de guidage sonore est un élément colonnaire s'étendant verticalement et présentant une forme en coupe transversale ayant un côté long et un côté court, dans laquelle chacune des plaques de lames de guidage sonore présente le côté long s'étendant radialement vers le point central dans la vue en plan de la face inférieure de base, dans lequel une intégralité ou une partie d'une coupe transversale de chacune des plaques de lames de guidage sonore fait saillie, d'une longueur prédéfinie, depuis une face latérale intérieure de la paroi de réflexion sonore dans une direction de rapprochement du point central dans la vue en plan.
2. Structure de bâtiment à espace acoustique selon la revendication 1, comprenant en outre une scène de source sonore (50) installée sur le point central de la face inférieure de base.
 3. Structure de bâtiment à espace acoustique selon la revendication 1, dans laquelle les plaques de lames de guidage sonore sont espacées du point central de la face inférieure de base par le même espacement, dans laquelle, dans une vue de dessus de la structure de bâtiment, les plaques de lames de guidage sonore sont agencées dans une forme circulaire ou dans une forme arquée dans laquelle une partie d'un cercle complet est ouverte.
 4. Structure de bâtiment à espace acoustique selon la revendication 1, dans laquelle chacune des plaques de lames de guidage sonore est constituée d'un matériau présentant un coefficient d'absorption sonore supérieur à un coefficient d'absorption sonore d'un matériau de la paroi de réflexion sonore.
 5. Structure de bâtiment à espace acoustique selon la revendication 1, dans laquelle une couche de finition d'absorption sonore constituée d'un matériau présentant un coefficient d'absorption sonore supérieur à un coefficient d'absorption sonore de la plaque de paroi de réflexion sonore est en outre formée sur une surface de chacune des plaques de lames de guidage sonore.
 6. Structure de bâtiment à espace acoustique selon la revendication 1, dans laquelle la plaque de lames de guidage sonore est entièrement constituée de bois ou est formée par le raccordement d'une plaque de bois à une surface d'une plaque de corps de celle-ci, dans laquelle la paroi de réflexion sonore est mise en œuvre sous la forme d'un panneau de verre.
 7. Structure de bâtiment à espace acoustique selon l'une des revendications 1 à 6, comprenant en outre une plaque de lames de guidage sonore horizontal présentant la même forme en coupe transversale qu'une forme en coupe transversale de chacune des plaques de lames de guidage sonore, dans laquelle la plaque de lames de guidage sonore horizontale s'étend dans une direction horizontale et le long de l'agencement des plaques de lames de guidage sonore.
 8. Structure de bâtiment à espace acoustique selon l'une des revendications 1 à 6, dans laquelle une partie de la coupe transversale de chacune des plaques de lames de guidage sonore fait saillie depuis une surface latérale intérieure de la paroi de réflexion sonore d'une longueur de saillie dans une plage de 8 à 30 cm.
 9. Structure de bâtiment à espace acoustique selon la revendication 3, dans laquelle les plaques de lames de guidage sonore sont agencées dans une forme arquée dans laquelle une partie d'un cercle est ouverte d'une plage d'angle prédéfinie dans la vue en plan, dans laquelle la plage d'angle prédéfinie est une plage de 0° à 120°.
 10. Structure de bâtiment à espace acoustique selon l'une des revendications 1 à 6, dans laquelle une distance du centre de la scène de source sonore à la paroi de réflexion sonore est dans une plage de 15 à 30 m,

dans laquelle une dimension verticale de chacune des plaques de lames de guidage sonore est dans une plage de 3 à 8 m,
dans laquelle la longueur de saillie de la partie de la coupe transversale de la plaque de lames de guidage sonore depuis la surface latérale intérieure de la plaque de paroi de réflexion sonore est dans une plage de 8 à 30 cm.

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FIG. 1

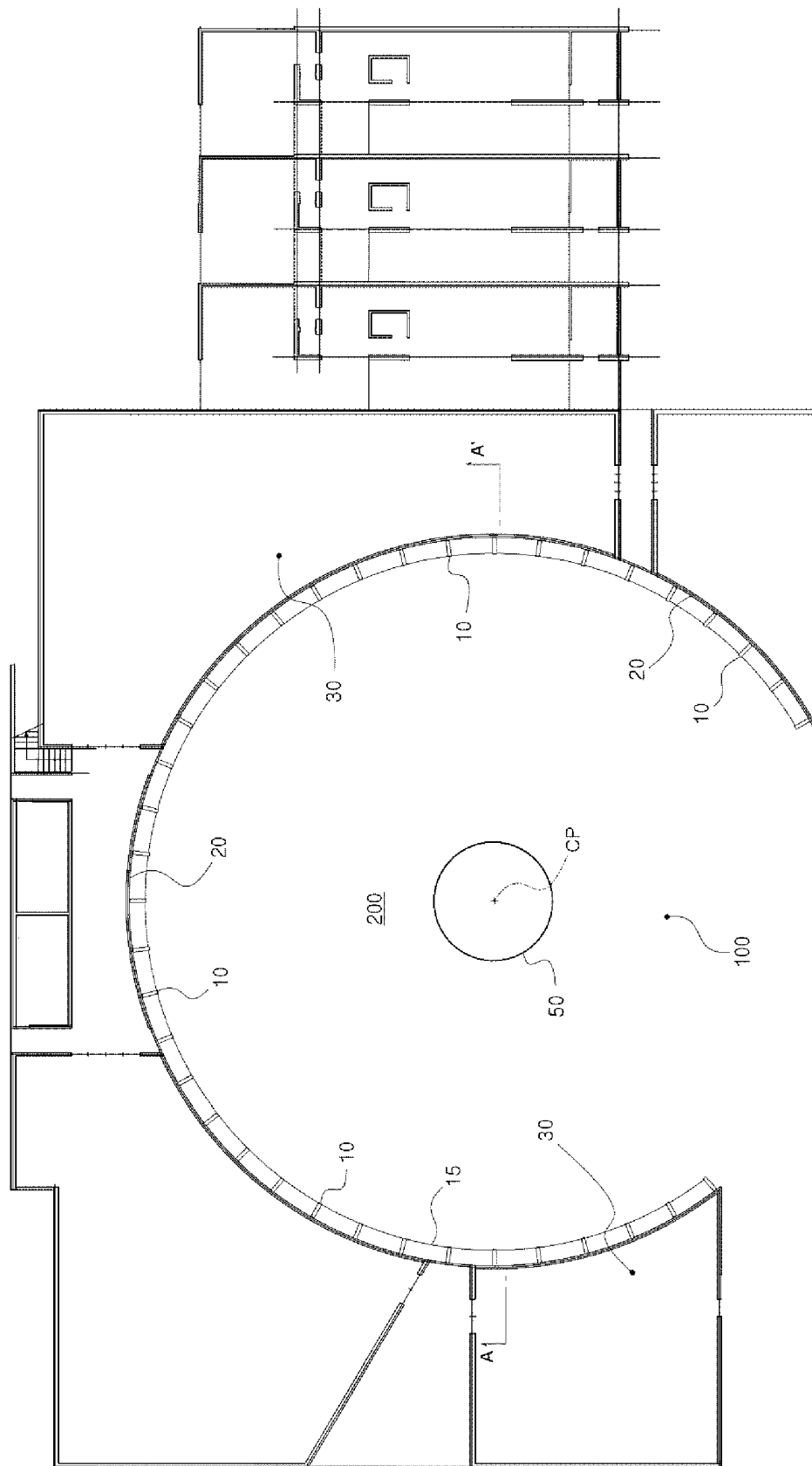


FIG. 2

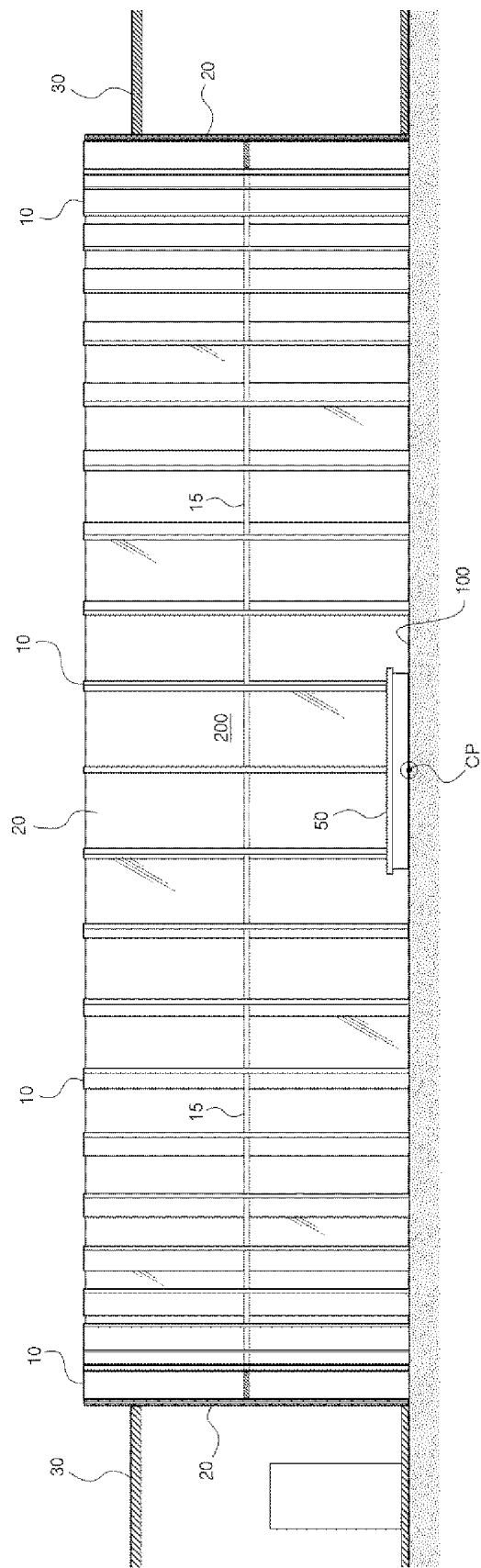


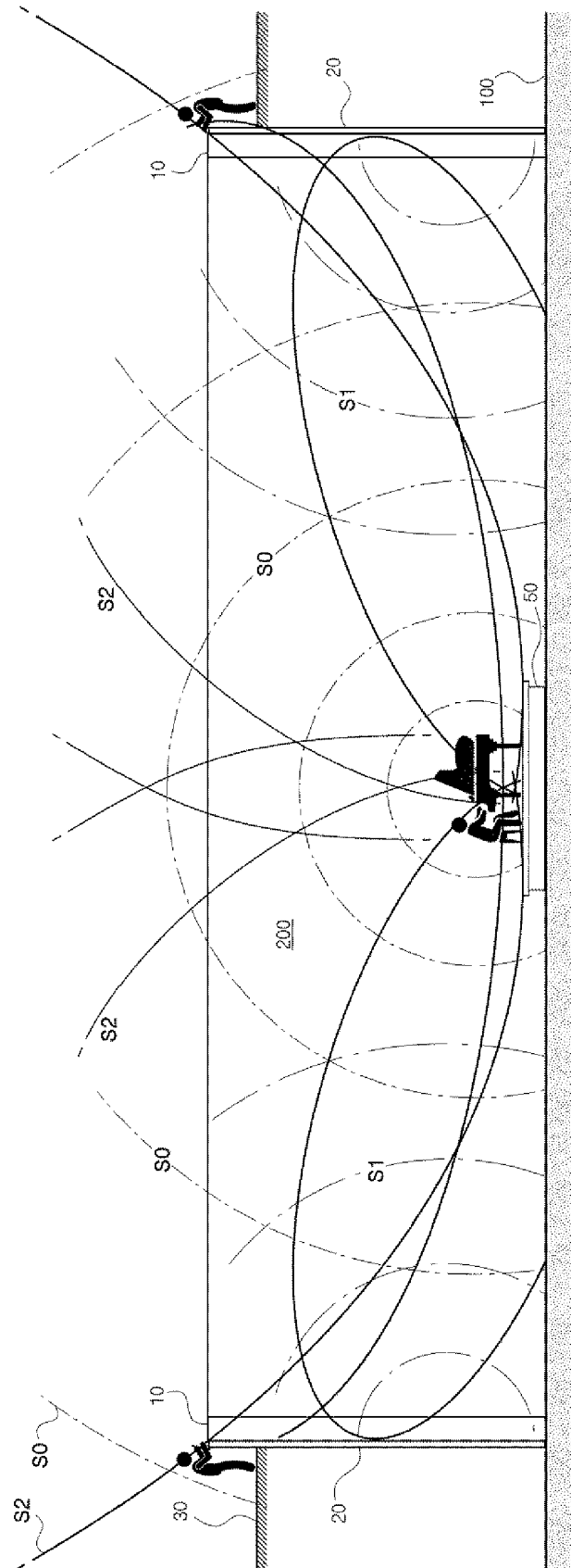
FIG. 3



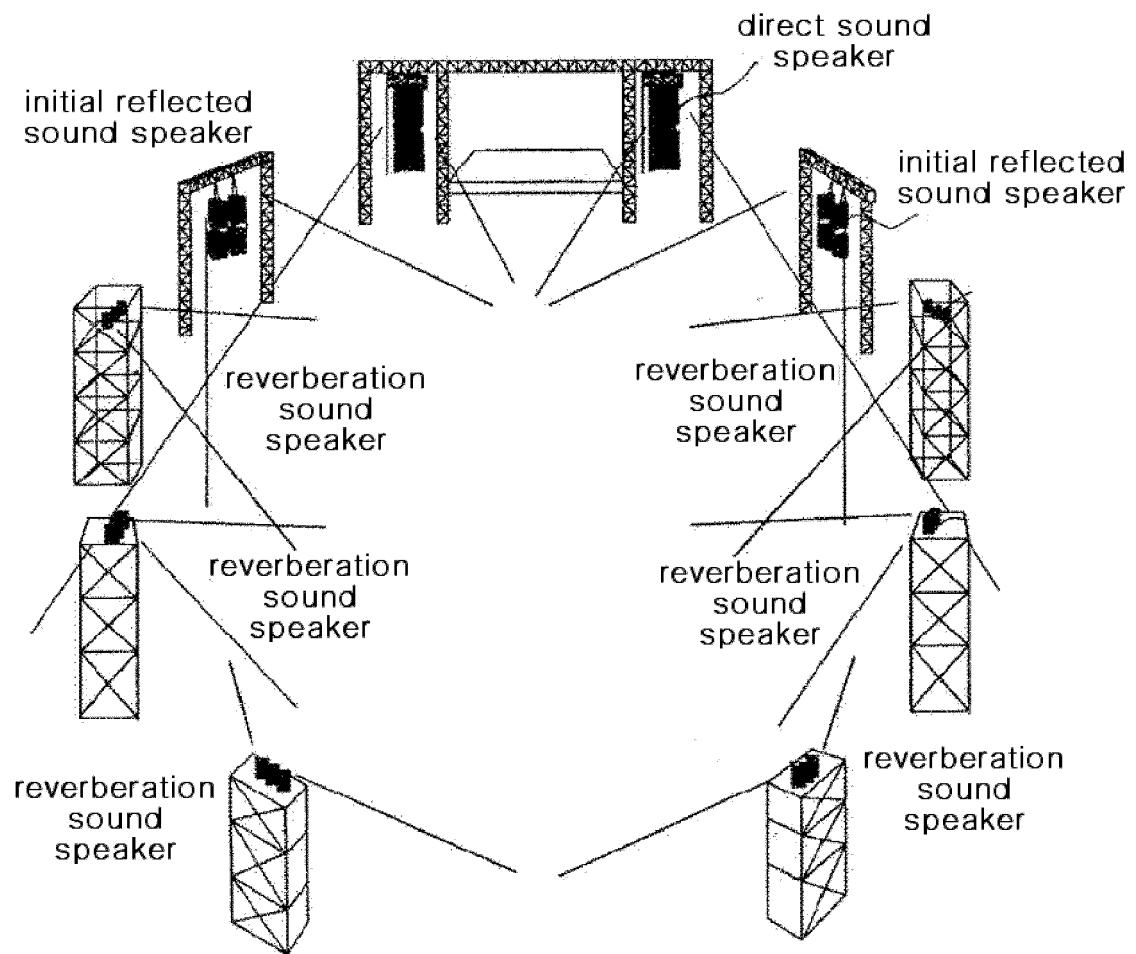
FIG. 4



FIG. 5



[FIG.6]



REFERENCES CITED IN THE DESCRIPTION

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