Title: THEATER STRUCTURE AND MULTI-PROJECTION SYSTEM USING THE SAME

Abstract: The present invention provides a theater structure which can be used to implement a "multi-projection system" and includes a projection equipment installed in a theater and a cover for preventing the projection equipment from being exposed to an auditorium, in which an image is projected on the surface of the cover.

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Description

Title of Invention: THEATER STRUCTURE AND MULTI-PROJECTION SYSTEM USING THE SAME

Technical Field

[1] The present invention relates to a theater structure and a "multi-projection system" using the same and, more particularly, to a theater structure which can prevent a projection equipment (e.g., a speaker, a projection device, a frame structure, etc.) from being exposed to an auditorium and can reproduce an image on the surface thereof, thus being used to implement a "multi-projection system".

[2]

Background Art

[3] Conventionally, in order to reproduce images such as movies, advertisements, etc., two-dimensional images are projected on a single screen arranged in front of a theater. However, audiences can only watch two-dimensional (2D) images under such a system.

[4] Three-dimensional (3D) image technologies for providing the audience with 3D images have recently been developed. 3D image technologies use the principle of allowing an audience to feel the 3D effect even from a flat image when different images are presented to the left and right eyes of the audience and combined in the brain. In detail, two cameras equipped with different polarizing filters are used during filming, and the audience wears glasses with polarizing filters such that different images are presented to the left and right eyes during watching.

[5] However, while these 3D technologies can provide the audience with 3D images, the audience just watches the images reproduced on a single screen, which may reduce the degree of involvement in the images. Moreover, the direction of the 3D effect that the audience feels is limited to the direction of the single screen.

[6] Furthermore, according to the conventional 3D technologies, the audience must wear the glasses equipped with polarizing filters during watching, which may make the audience feel inconvenient, and different images are artificially presented to the left and right eyes, which may make some sensitive audiences feel dizzy or nausea.

[7] Therefore, a so-called "multi-projection system" which can solve the problems of the conventional projection systems based on a single screen has been proposed. The "multi-projection system" refers to a technology in which a plurality of projection surfaces are arranged around auditorium such that synchronized images are reproduced on the plurality of projection surfaces, thus providing the audience with the three-dimensional effect and immersion.
Meanwhile, the plurality of projection surfaces are necessarily required to implement the "the multi-projection system". Therefore, it is necessary to install an additional projection surface so as to construct the "multi-projection system" in a conventional theater having only a single screen (i.e., a traditional screen).

However, it is not easy to install a traditional white or silver screen in the theater that has already been completed, and small and large constructions are required. Moreover, it may be impossible to additionally install the screen due to the nature of the internal structure of some specific theaters.

Moreover, when a "structural surface (e.g., a wall surface, floor surface, ceiling surface, etc.) itself is to be used as the projection surface without installing an additional screen, a normal projection surface cannot be implemented due to multiple projection equipments installed on the structural surface (various projection equipments are installed on the structural surface of the theater as shown in FIG. 1, and thus when the structural surface of the theater itself is used as the projection surface, the reproduced image is seriously distorted by the appearance of the projection equipments).

Therefore, there is a need to develop a new technology that can implement a "plurality of projection surfaces" for multi-projection without additionally installing a traditional screen in the theater and can implement a "plurality of normal projection surfaces (providing an image with less distortion)" even when various projection equipments are installed on the structural surface).

The present invention has been made in an effort to solve the above-mentioned problems and to provide additional technical elements that cannot be easily invented by those skilled in the art.

**Disclosure of Invention**

**Technical Problem**

An object of the present invention is to implement a multi-projection environment without installing an additional screen (i.e., a traditional screen).

Moreover, another object of the present invention is to provide a smooth projection surface even when various projection equipments are installed on a structural surface of a theater.

Furthermore, the present invention can solve additional problems that may occur from the description of the specification in addition to the above-mentioned problems.

**Solution to Problem**

To achieve the above object, a theater structure in accordance with an embodiment of
the present invention may comprise: a projection equipment installed in a theater; and
a cover for preventing the projection equipment from being exposed to an auditorium,
wherein an image is projected on the surface of the cover.

[19]  In the theater structure in accordance with an embodiment of the present invention,
the projection equipment may be installed on a wall surface, a floor surface, or a
ceiling surface of the theater, and the cover may prevent the wall surface, the floor
surface, or the ceiling surface and the projection equipment from being exposed.

[20]  In the theater structure in accordance with an embodiment of the present invention,
the projection equipment may be installed on the ceiling surface and the cover may
comprise a dome-shaped surface.

[21]  In the theater structure in accordance with an embodiment of the present invention,
the cover may comprise an optical coating layer formed on the surface thereof.

[22]  In the theater structure in accordance with an embodiment of the present invention,
the theater may comprise a projection surface installed therein, and synchronized
images may be projected on the surface of the cover and the projection surface.

[23]  In the theater structure in accordance with an embodiment of the present invention,
images corrected in different ways may be projected on the projection surface and the
surface of the cover.

[24]  In the theater structure in accordance with an embodiment of the present invention,
the correction may be based on a difference in surface morphology, a difference in
surface chromaticity, a difference in surface brightness, or a difference in surface re-
'flectance.

[25]  In the theater structure in accordance with an embodiment of the present invention,
the projection equipment may be a projection device, the projection device projecting
an image on the cover by rear projection.

[26]  In the theater structure in accordance with an embodiment of the present invention,
the cover may comprise a rear screen film for the rear projection.

[27]  In the theater structure in accordance with an embodiment of the present invention,
the cover may prevent all or part of the projection equipment from being exposed.

[28]  In the theater structure in accordance with an embodiment of the present invention,
the cover may comprise an opening for exposing part of the projection equipment.

[29]  In the theater structure in accordance with an embodiment of the present invention,
the projection equipment may be a projection device, the projection device projecting
an image on the projection surface through the opening.

[30]  In the theater structure in accordance with an embodiment of the present invention,
the opening may be opened and closed by electrical control.

[31]  In the theater structure in accordance with an embodiment of the present invention,
the projection equipment may be an additional effect device, the additional effect
device being exposed to the auditorium through the opening at a predetermined time.

In the theater structure in accordance with an embodiment of the present invention, the cover may have colors in gradation formed on an outer edge thereof.

In the theater structure in accordance with an embodiment of the present invention, the colors in gradation may be formed based on a color of the cover and a color of an adjacent projection surface.

Meanwhile, to achieve the above object, a theater in accordance with an embodiment of the present invention may comprise: a projection equipment installed in the theater; and a cover for preventing the projection equipment from being exposed to an auditorium.

Meanwhile, to achieve the above object, a multi-projection system in accordance with an embodiment of the present invention may comprise: a projection surface on which an image is projected; and a cover for preventing a projection equipment installed in a theater from being exposed to an auditorium, wherein synchronized images are projected on the surface of the cover and the projection surface.

In the multi-projection system in accordance with an embodiment of the present invention, the cover may comprise an optical coating layer formed on the surface thereof.

In the multi-projection system in accordance with an embodiment of the present invention, images corrected in different ways may be are projected on the surface of the cover and the projection surface.

**Advantageous Effects of Invention**

The present invention can further provide a projection surface on which an image is smoothly projected without having to additionally install a "traditional white or silver screen" in a theater. Specifically, the present invention can further provide a projection surface by additionally installing a simple "cover" on a structural surface of a conventional theater with its own structure and using the surface of the installed "cover". Therefore, with the additional installation of the simple "cover", it is possible to increase the number of projection surfaces without having to additionally install any traditional screen.

Moreover, the present invention can further provide a normal projection surface (providing an image with less distortion) while maintaining projection equipments (e.g., a speaker, a lighting device, a projection device, a special effect device, a skeletal frame, etc.), which are installed on the structural surface in the theater in a complex manner, as they are. Specifically, since the present invention further provides a "cover", which can accommodate the projection equipments installed on the structural
surface, and projects an image on the surface of the "cover", it is possible to provide a projection surface (providing an image with less distortion) without having to change the installation positions of the previously installed projection equipments.

Furthermore, the present invention can configure the additionally installed "cover" to have a domed shape. Therefore, when implementing a "multi-projection environment" using the "cover", the present invention can surround the auditorium using a plurality of projection surfaces and also using the domed shape of the "cover" itself in view of a single projection surface, thus further improving the immersion of the audience in the image.

In addition, the present invention can further provide an optical coating layer formed on the surface of the additionally installed "cover". Therefore, it is possible to improve the quality of the image reproduced on the surface of the "cover" and reduce the heterogeneity of images reproduced on different types of projection surfaces.

Moreover, the present invention can correct an image projected on the "surface of the cover" and an image produced on "different types of projection surfaces". Specifically, the present invention can correct the images in different ways depending on differences in properties (e.g., color, chromaticity, shape, brightness, reflectance, etc.) between the "surface of the cover" and "different types of projection surfaces", thus reducing the heterogeneity between the images.

Furthermore, the present invention can form colors in gradation on an outer edge of the "cover". Therefore, it is possible to reduce the heterogeneity at the boundary when the color of the "cover" is quite different from that of an adjacent projection surface.

In addition, the present invention can, of course, include any additional effects that may be derived from the description of the specification in addition to the above-mentioned effects.

**Brief Description of Drawings**

FIG. 1 is a diagram showing an example of a conventional structural surface (e.g., a ceiling surface, wall surface, floor surface, etc.) on which projection equipments are installed.

FIG. 2 is a diagram showing a theater structure in accordance with an embodiment of the present invention.

FIG. 3 is a diagram showing a theater structure in the form of a dome in accordance with an embodiment of the present invention.

FIG. 4 is a diagram showing an example of an optical coating layer formed in a theater structure in accordance with an embodiment of the present invention.

FIG. 5 is a diagram showing an example of an opening formed in a theater structure
in accordance with an embodiment of the present invention.

FIG. 6 is a diagram showing an example of an openable and closable opening formed in a theater structure in accordance with an embodiment of the present invention.

FIG. 7 is a diagram showing an example of a multi-projection environment implemented using a theater structure in accordance with an embodiment of the present invention.

FIG. 8 is a diagram showing an example of a theater structure with colors in gradation in accordance with an embodiment of the present invention.

FIG. 9 is a diagram showing an example of projection equipments that may be included in a multi-projection system in accordance with an embodiment of the present invention.

FIG. 10 is a diagram showing an example of a theater structure in accordance with another embodiment of the present invention.

FIG. 11 is a diagram showing an example of a theater structure in accordance with still another embodiment of the present invention.

Mode for the Invention

Hereinafter, a theater structure and a "multi-projection system" using the same in accordance with embodiments of the present invention will be described in detail with reference to the accompanying drawings. The following embodiments are provided only for illustrative purposes so that those skilled in the art can fully understand the spirit of the present invention, but the present invention is not limited thereby. Moreover, it is to be understood that all matters herein set forth in the accompanying drawings are to be interpreted as illustrative and may be in different forms from those actually implemented.

Meanwhile, components described below are merely examples to implement the present invention. Therefore, other components may be used in other embodiments without departing from the idea and scope of the invention. Moreover, each component may be implemented only in hardware, or only in software, or in various combinations of hardware and software performing the same functions.

Furthermore, while terms including ordinal numbers such as "first", "second", "third", etc. may be used to describe various components, the above terms are used only to distinguish one component from another, and the properties of such components are not limited by the above terms.

In addition, when a component is mentioned to be "connected" to or "accessing" another component, this may mean that it is directly connected to or accessing the other component, but it is to be understood that another component may exist in-
Meanwhile, as used herein, the term "structural surface" refers to surfaces that form an internal structure of a theater. The "structural surfaces" may include various surfaces such as a ceiling surface, a floor surface, a wall surface, etc. which are formed in the theater.

Moreover, as used herein, the term "traditional screen" refers to a white screen, a light gray screen, a silver screen, etc. which are mainly installed in conventional theaters.

Furthermore, as used herein, the term "other projection surfaces" refers to all projection surfaces other than a projection surface (i.e., the surface of a cover which will be described later) which may be formed by a theater structure according to the present invention. Therefore, the "other projection surfaces" may include various projection surfaces such as a traditional screen, a wall surface, etc.

Next, a theater structure in accordance with an embodiment of the present invention will be described with reference to FIGS. 2 to 4.

Referring to FIG. 2, the theater structure in accordance with an embodiment of the present invention may comprise a projection equipment 200 installed in a theater and a cover 100 for preventing the projection equipment 200 from being exposed to an auditorium, and the surface of the cover 100 may be used as a projection surface on which an image is projected.

The projection equipment 200 refers to various equipments installed in the theater for the projection itself or to assist the projection.

The projection equipment 200 may include various equipments formed in the theater such as a projection device, an acoustic device (e.g., a speaker, etc), a light-emitting device, an air blower, a fragrance diffuser, a fog machine, a heater, a cooler, a laser device, a bubble generator, an LED, a water jet, a vibrator, a frame structure for installing a device, an internal frame structure of a theater, etc. as well as various other equipment that can be installed on the structural surface of the theater.

Meanwhile, in a conventional theater, these projection equipments 200 are installed on the structural surfaces (e.g., a left side, right side, rear side, floor side, ceiling side, etc.) other than the front side on which the "traditional screen" is installed, and thus it is difficult to additionally installed the "traditional screen" on any structural surface. Moreover, when the corresponding structural surface itself is to be used as a projection surface, it is impossible to implement a normal projection surface due to image distortion caused by the projection equipments installed on the surface (e.g., by the physical appearance of the projection equipments).

The present invention can additionally form a smooth projection surface (providing an image with less distortion) by additionally installing a cover 100, which can prevent
the projection equipment from being exposed to the outside, and using the "surface of the cover 100" itself as a projection surface, without having to change the structure of the conventional theater or change the installation position of the projection equipment.

The cover 100 is configured to prevent the projection equipment from being exposed to the auditorium as briefly described above. Specifically, the cover 100 is provided between the projection equipment, installed on the structural surface (e.g., a wall surface, ceiling surface, floor surface, etc.), and the auditorium to prevent the projection equipment from being exposed to the auditorium.

It is preferable that the cover 100 comprises a surface without irregularities so as to serve as a smooth projection surface (providing an image with less distortion) based on the surface without irregularities. Therefore, the cover 100 can reproduce an image, projected by a cover projection device 150, smoothly using the surface without irregularities in a state where the projection device 200 and the structural surface are prevented from being exposed, thus providing the audience with an additional image. Meanwhile, the direction that the image is to be projected on the surface of the cover 100 may be configured in various ways. For example, the image may be projected on the external surface of the cover 100 from the outside of the cover 100 (as shown in the embodiment of FIG. 2) or the image may be projected on the internal surface of the cover 100 from the inside where the projection equipment 200 is accommodated (not shown).

Moreover, the cover 100 may be configured in the form of a cover having an internal space and may be configured to be attached to and detached from the structural surface of the theater. Therefore, the cover 100 can accommodate the projection equipment using its internal space and can additionally accommodate an equipment, which is required to be installed, by the attachment and detachment of the cover 100.

Furthermore, the cover 100 may comprise various types of surfaces. Specifically, the cover 100 may comprise various types of surfaces such as a domed shape, a polygonal shape, a circular shape, etc. The cover 100 may be configured in various forms depending on the characteristics of content to be projected or the characteristics of the theater and then applied to the theater.

In addition, the cover 100 may comprise a surface on which an optical coating layer is formed, which will be described in detail later. Therefore, it is possible to implement a projection surface of high quality through the surface on which the optical coating layer is formed and to reduce the heterogeneity that may occur between other projection surfaces.

Additionally, the cover 100 may have colors in gradation, which will be described in detail later. Specifically, colors in gradation may be formed on an outer edge of the cover 100 so as to reduce the heterogeneity at the boundary when the color of the cover
100 is quite different from that of an adjacent projection surface.

Moreover, the cover 100 may comprise an opening, which will be described in detail later. Therefore, it is possible to transmit the operation of the projection device 200, accommodated in the cover 100, to the outside through the opening. For example, the projection device 200 accommodated in the cover 100 may project an image on a projection surface disposed on the outside of the cover 100 through the opening, or an additional effect device accommodated in the cover 100 may transmit an additional effect (e.g., sound, scent, water, wind, etc.) to the outside through the opening.

Furthermore, the cover 100 may comprise an opening which can be opened and closed by electrical control, which will be described in detail later. Therefore, it is possible to basically implement a sealed surface, on which an image can be projected smoothly, and to transmit the operation of the projection device to the outside by selectively opening and closing the opening, if necessary.

In addition, a synchronized image may be projected on the surface of the cover 100, which will be described in detail later. Specifically, an image synchronized with an image projected on a projection surface installed in the theater may be projected on the surface of the cover 100. Therefore, the surface of the cover 100 may implement a multi-projection environment in conjunction with the projection surface installed in the theater, thus providing the audience with a synchronized and unified image.

Additionally, a corrected image may be projected on the surface of the cover 100, which will be described in detail later. Here, the correction may be based on the surface, color, chromaticity, brightness, reflectance, material quality, etc. Moreover, the correction may be based on differences in properties between the "surface of the cover 100" and the projection surface installed in the theater. Specifically, the correction may be performed so as to offset the differences in properties between the "surface of the cover 100" and the projection surface (e.g., a difference in color, a difference in chromaticity, a difference in brightness, a difference in reflectance, a difference in shape, a difference in material quality, etc.).

Referring to FIG. 3, the theater structure in accordance with an embodiment of the present invention may comprise a cover 100 configured in the form of a dome.

Specifically, the theater structure in accordance with an embodiment of the present invention may comprise a cover 100 formed on the structural surface such as a ceiling surface, a floor surface, a wall surface, etc. Here, the cover 100 may preferably comprise a dome-shaped surface as shown in FIG. 3.

Therefore, the theater structure in accordance with an embodiment of the present invention can surround the auditorium through the domed shape itself and project an image on the dome-shaped surface (i.e., the surface of the cover 100), thus further maximizing the immersion that the audience feel (because the audience can feel more
as if they are surrounded by the image).

In particular, when the multi-projection system is implemented using the surface of the dome-shaped cover 100, the audience can be surrounded primarily by a plurality of projection surfaces and surrounded secondarily by the domed shape in a specific direction that the cover 100 is present, and thus the three-dimensional effect and immersion that the audience feels can be further maximized.

Referring to FIG. 4, the theater structure in accordance with an embodiment of the present invention may comprise an optical coating layer 110 formed on the surface of the cover 100.

Specifically, the theater structure in accordance with an embodiment of the present invention may comprise the optical coating layer 110 formed on the surface of the cover 100 so as to implement an image of high quality on the surface of the cover 100. Therefore, the theater structure in accordance with an embodiment of the present invention may provide an image quality at a level similar to that of other projection surfaces installed in the theater through the optical coating layer 110, thus reducing the heterogeneity that may occur between the images projected on the "other projection surfaces".

The optical coating layer 110 is configured to improve the optical properties of the surface of the cover 100. The optical coating layer 110 may change the surface of the cover 100 to a smooth shape (without irregularities) or change the surface quality of the cover 100 to have excellent optical properties (e.g., polarization properties, reflectance properties, scattering properties, etc.).

Meanwhile, the optical coating layer 110 may be formed by various methods, preferably by applying an optical paint. Specifically, the optical coating layer 110 may be formed by applying an optical paint capable of improving the optical properties on the surface of the cover 100. Here, the optical paint may comprise various types or various states of materials and may preferably comprise optical particles for improving the optical properties and a fluid that serves as a carrier.

The optical particles refer to particles contained in the optical coating layer to improve the optical properties. The optical particles may comprise various fine particles for improving the optical properties such as, for example, metal particles (e.g., aluminum) having excellent reflection properties, dielectric particles (e.g., silicon oxide particles, magnesium fluoride particles, etc.) having excellent optical properties, etc. Meanwhile, the optical particles may be formed by cutting or pulverizing an optical substrate including a metal layer (e.g., an aluminum layer, etc.) or a dielectric layer (e.g., a silicon oxide layer, etc.). That is, the optical particles may be formed by deforming the optical substrate including the metal layer or dielectric layer into small particles by a physical method.
The fluid serves as a carrier that allows the optical particles to be coated. The fluid may comprise various fluid materials and may preferably comprise PVC resin, enamel, polyurethane, acrylic resin, lacquer, etc.

Next, an example of an opening formed in the theater structure in accordance with an embodiment of the present invention will be described with reference to FIG. 5.

Referring to FIG. 5, the cover 100 may comprise an opening 120 for partially exposing the projection device accommodated in the cover 100.

Therefore, the operation of the projection device 200 accommodated in the cover 100 may be transmitted to the outside through the opening 120. For example, when a projection device 220 or a light-emitting device 230 is accommodated in the cover 100 as shown in FIG. 5, an image projected by the projection device 220 or light projected by the light-emitting device 230 may be transmitted to the outside through the opening 120.

In this case, it is preferable that the opening 120 is configured to have a minimized size. Specifically, it is preferable that the opening 120 has a minimized size that exposes only a minimum of the projection device 200 required to transmit the operation of the projection device 200 to the outside. When the surface of the cover 100 is used as a projection surface, the image may be distorted by the opening 120 (e.g., by the physical appearance of the opening 120), and thus it is necessary to minimize the size of the opening 120. Therefore, it is preferable that the opening 120 is configured to have a minimized size so as to expose only a lamp of the projection device 220 or a lamp of the light-emitting device 230.

Referring specifically to FIG. 5, the theater structure in accordance with an embodiment of the present invention may comprise the cover 100 for accommodating the projection equipment 200 such as the projection device 220, the light-emitting device 230, etc. Moreover, the cover 100 comprises the opening 120 for exposing only the lamp of the projection device 220 or the lamp of the light-emitting device 230 to the outside. Furthermore, the opening 120 is configured to have a minimized size that exposes only the lamp of the projection device 220 or the lamp of the light-emitting device 230 to the outside.

Therefore, even when the image is projected on the surface of the cover 100 as shown in FIG. 5, the projection devices 220 accommodated in the cover 100 can project images on "other projection surfaces" disposed around the cover 100 (meanwhile, when another cover is disposed around the cover 100, unlike the embodiment of FIG. 5, the projection device 220 accommodated in the cover 100 can project an image on the surface of another cover).

Meanwhile, when the opening 120 is formed in the cover 100, the image projected on the cover 100 may be distorted by the presence of the opening 120 even when the
opening 120 has a minimized size. Therefore, the present invention may allow a corrected image to be projected on the surface of the cover 100 including the opening 120. Specifically, the present invention may analyze information on the distortion caused by the opening 120 and then correct the image so as to offset the distortion caused by the opening 120. For example, the present invention may correct the image by analyzing information on the distortion of the image caused by the opening 120 or by analyzing the information on the distortion of the surface geometry caused by the opening 120. Moreover, the present invention may also correct the image by analyzing information on a difference in brightness, a difference in reflectance, etc. caused by the opening 120.

[99] This correction operation may be performed by various devices including a management device which will be described later.

[100] Next, an example of an openable and closable opening formed in the theater structure in accordance with an embodiment of the present invention will be described with reference to FIG. 6.

[101] The theater structure in accordance with an embodiment of the present invention may comprise an openable and closable opening 120. Specifically, the theater structure in accordance with an embodiment of the present invention may comprise an opening 120 that may be opened when the operation of the projection device 200 accommodated in the cover 100 is required to be transmitted to the outside and may be closed when the operation of the projection device 200 is not required to be transmitted to the outside. Therefore, with the openable and closable opening 120, it is possible to minimize the time required by the projection equipment 200 to be exposed to the outside and to minimize the time required by surface of the cover 100 to provide the smoothest projection surface.

[102] The opening 120 may selectively expose various projection equipments 200 to the outside. Specifically, by the opening and closing operation, the opening 120 may selectively expose the projection device 220, the light-emitting device 230, an additional effect device 240, etc., which are accommodated in the cover 100, only at a specific time.

[103] Meanwhile, the theater structure in accordance with an embodiment of the present invention may accommodate a movable additional effect device 240 in the cover 100. Specifically, the theater structure may comprise the movable additional effect device 240 (which is fixed to a frame capable of performing a linear or rotational motion and can be moved by the motion of the frame, for example) as shown in FIG. 6. Therefore, in this embodiment, when the opening 120 is opened, the additional effect device 240 can be fully exposed to the auditorium by the motion, whereas, when the opening 120 is closed, the additional effect device 240 can be completely accommodated in the
cover 100 by the motion.

For reference, the additional effect device 240 is a device for implementing an additional effect other than the image and may be implemented with various projection equipments. For example, the additional effect device 240 may be configured to expose a structure that matches a reproduced image to the audience (for example, to expose a planet-shaped structure to the field of view of the audience when a planet crashing scene in the space is reproduced or to expose a remnant (e.g., a structure) of an aircraft when an aircraft crashing scene is reproduced). Moreover, the additional effect device 240 may be configured with various other devices, which can stimulate the five senses of human, such as a speaker, an air blower, a fragrance diffuser, a fog machine, a heater, a cooler, a laser device, a bubble generator, an LED, a water jet, etc.

Meanwhile, the opening and closing operation of the opening 120 and the operation (motion) of the additional effect device 240 may be controlled by various devices including a management device which will be described later. In this case, the opening and closing operation of the opening 120 and the operation of the additional effect device 240 may be controlled in a manner to be associated with an image projected on the surface of the cover 100 or an image projected on the other projection surface. For example, the opening and closing operation of the opening 120 and the operation of the additional effect device 240 may be controlled based on a time code of image data projected on the surface of the cover 100 or the other projection surface in a manner to operate at a specific time in the time code.

The present invention may construct the "multi-projection system" using the above-described theater structure.

First of all, the present invention may construct the "multi-projection system" by simultaneously using a plurality of "other projection surfaces 300" and the surface of the cover 100, which are installed in the theater. For example, as shown in FIG. 7, the "multi-projection system" may be implemented by arranging other projection surfaces 300 on the front, left, right, and floor surfaces and arranging the cover 100 on the ceiling surface such that images are reproduced on the front, left, right, floor, and ceiling surfaces (for reference, the reason that the ceiling projection surface is implemented with the cover 100 in the embodiment of FIG. 7 is that various projection equipments are installed on the ceiling of the typical theater in a complex manner, which makes it difficult to implement a projection surface having a smooth surface).

Moreover, when the projection equipments are installed in a complex manner on the floor surface, the left surface, the right surface, the front surface, or the rear surface as well as the ceiling, the present invention may install the cover 100, not the "other projection surface 300" on the floor surface, the left surface, the right surface, the front surface, or the rear surface, respectively. Therefore, in this embodiment, among the
plurality of projection surfaces for implementing the multi-projection, two or more projection surfaces may be implemented using the cover 100.

Furthermore, the present invention may implement all projection surfaces for implementing the multi-projection system using the cover 100. For example, the present invention may form the cover 100 on the front surface, the left surface, the right surface, the ceiling surface, and the floor surface, respectively, and implement the plurality of projection surfaces using the plurality of covers 100.

Meanwhile, as briefly described above, the "other projection surfaces 300" may include various projection surfaces other than the projection surface implemented using the surface of the cover 100. Specifically, the "other projection surfaces 300" may include various projection surfaces such as a "screen", "structural surface", etc. on which an image can be projected.

Here, the "screen" is configured to reflect an image projected by the projection device, etc. to allow the audience to enjoy the image and may be of various types within the scope that can perform the above function.

For example, the screen may be formed of various materials such as a PVC screen, a white-coated PVC screen, a pearl gloss-coated PVC screen, an aluminum-coated PVC screen, a matte screen, a lenticular screen, a glass beaded screen, a silver screen, a high-gain screen, etc. Moreover, the screen may be of various types such as an embedded electric screen, an exposed electric screen, a wall-mounted screen, a tripod screen, a road warrior screen, a high-brightness screen, a sound screen, etc. Furthermore, the screen may include a water screen, a fog screen, a holographic screen, a miracle screen (using magic glass), etc. as well as other various types of screens.

Meanwhile, the screen may be formed of an object that does not fall within the scope of the "traditional screen" or an object whose own name is not the screen (that is, even when the own name of a particular object is not the screen, if the surface of the specific object can serve an image projection surface, it may fall within the scope of the screen). For example, when objects such as a panel, curtain, etc. are installed in the theater such that an image can be projected on the surface of the object, the objects may fall within the scope of the screen regardless of their own names.

Moreover, as mentioned above, the "structural surface" refers to a structural surface formed in the theater and includes various surfaces such as the ceiling surface, floor surface, wall surface (e.g., a front wall, left wall, right wall, rear wall, etc.), etc.

Meanwhile, after constructing the multi-projection system, the present invention may project synchronized images on the plurality of projection surfaces. Therefore, the present invention allows the audience to feel as if they are actually in a scene created by the images projected on the plurality of projection surfaces arranged to surround the audience.
Moreover, after constructing the multi-projection system, the present invention may project images, which are corrected in different ways, on the plurality of projection surfaces. Specifically, (1) when some of the plurality of projection surfaces are implemented using the cover 100 and the rest of the projection surfaces are implemented using the "other projection surfaces 300", the present invention may correct the image projected on the surface of the cover 100 and the images projected on the "other projection surfaces 300" in different ways. When images corrected in the same manner are projected on the surface of the cover 100 and the "other projection surface 300", which have different properties, the images reproduced on both projection surfaces may cause heterogeneity, thereby reducing the immersion of the audience. (2) Moreover, when two or more covers 100 having different properties are included in the plurality of projection surfaces, the present invention may allow images, which are corrected in different ways, on the surfaces of the two or more covers 100. (3) Otherwise, when two or more "other projection surfaces 300" having different properties are included in the plurality of projection surfaces, the present invention may allow images, which are corrected in different ways, on the surfaces of the two or more "other projection surfaces 300".

As a result, when the multi-projection system is implemented using the plurality of projection surfaces having different properties, the present invention may project the images corrected in different ways on the plurality of projection surfaces.

Here, the correction may be based on a difference in surface morphology. That is, images, which are corrected in different ways based on the difference in surface morphology (so as to offset the difference in surface morphology), may be projected on the plurality of projection surfaces.

Moreover, the correction may be based on a difference in surface color or chromaticity. That is, images, which are corrected in different ways based on the difference in surface color or chromaticity (so as to offset the difference in surface color or chromaticity), may be projected on the plurality of projection surfaces.

Furthermore, the correction may be based on a difference in surface brightness. That is, images, which are corrected in different ways based on the difference in surface brightness (so as to offset the difference in surface brightness), may be projected on the plurality of projection surfaces.

In addition, the correction may be based on a difference in surface reflectance. That is, images, which are corrected in different ways based on the difference in surface reflectance (so as to offset the difference in surface reflectance), may be projected on the plurality of projection surfaces.

Additionally, the correction may be based on differences in various properties other than the above-mentioned properties.
Meanwhile, it is preferable that the process of correcting the images, projected on the plurality of projection surfaces, based on the differences in properties of the plurality of projection surfaces is performed "so as to reduce the differences in properties of the plurality of projection surfaces" because the purpose of the correction is to offset the heterogeneity.

Representatively, the correction based on the information on the difference in chromaticity between the projection surfaces will now be described (the process which will be described below can, of course, be applied to the correction based on the difference in color, difference in brightness, difference in reflectivity, difference in morphology etc.). First, it is possible to calculate information on the difference in chromaticity between the projection surfaces based on chromaticity information of the respective projection surfaces. In detail, it is possible to set a single reference projection surface and then calculate information on a relative difference in chromaticity of each projection surface. For example, the information on the relative difference in chromaticity is calculated in such a manner that "projection surface A has a red (R) color level 50 higher than that of the reference projection surface, a green (G) color level 40 higher than that of the reference projection surface, and a blue (B) color level the same as that of the reference projection surface". After the information on the difference in chromaticity of the respective projection surfaces is calculated in this manner, the images may be corrected based on the calculated information in such a manner so as to "reduce the R color level of the image projected on projection surface A by 50, reduce the G color level by 40, and maintain the B color level", for example. Therefore, the difference in chromaticity of the projection surfaces can be offset by this process.

Meanwhile, the analysis of the differences in properties of the plurality of projection surfaces may be performed in various ways other than the method of setting the reference projection surface. For example, it is possible to calculate representative values (e.g., mean values, median values, mode values, etc.) for the properties of the plurality of projection surfaces and then analyze the relative differences in properties based on the calculated representative values.

Meanwhile, the multi-projection system in accordance with an embodiment of the present invention may comprise a cover 100 having colors in gradation formed on an outer edge thereof. Here, it is preferable that the colors in gradation are formed based on a color of the cover 100 and a color of an adjacent projection surface. For example, when the color of the cover 100 is black and that of the adjacent projection surface is black, it is preferable that the colors in gradation express the change in colors between black and white.

Therefore, when the surface of the cover 100 and the "other projection surface 300" have different colors, the heterogeneity that may occur at the boundary between the
projection surfaces can be reduced using the colors in gradation. Moreover, even when the multi-projection system comprises two or more covers 100 arranged adjacent to each other and having different colors, the present invention may reduce the heterogeneity that occur at the boundary between the covers 100 using the colors in gradation.

[128] A specific example of this embodiment is shown in FIG. 8. In the multi-projection system of FIG. 8, the "other projection surfaces 300" are arranged on the front side, the left side, and the right side, and the cover 100 is arranged on the ceiling. In this case, the "other projection surfaces 300" and the surface of the cover 100 have different colors, and thus a high heterogeneity may occur at the boundary between the projection surfaces. However, the present invention provides colors in gradation on an outer edge of the cover 100 so as to prevent the high heterogeneity that may occur at the boundary between the projection surfaces.

[129] Meanwhile, in addition to the above-described plurality of projection surfaces, the multi-projection system in accordance with an embodiment of the present invention may further comprise "two or more projection devices" for projecting images on the plurality of projection surfaces and an "additional effect device" for implementing an additional effect during the projection and may further comprise a management device for controlling the two or more projection devices and the additional effect device. Moreover, in addition to the two or more projection devices and the additional effect device, the multi-projection system in accordance with an embodiment of the present invention may comprise various other projection equipments, which may also be controlled by the management device.

[130] An example of devices that may be included in the multi-projection system is shown in FIG. 9. The multi-projection system shown in the embodiment of FIG. 9 may comprise projection devices 320 for projecting images on "other projection surfaces" than the cover and may also comprise an additional effect device 340 for implementing an additional effect during the projection and other projection equipments. Moreover, the multi-projection system may comprise a management device 400 for controlling various devices installed in the theater.

[131] The two or more projection devices are devices for projecting images on the plurality of projection surfaces and may comprise a cover projection device 150 for projecting an image on the cover 100 or projection devices 320 for projecting images on the "other projection surfaces 300". Here, the ratio of the two or more projection devices to the cover projection device 150 or the projection devices 320 for the "other projection surface" may be different depending on the distribution ratio of the plurality of projection surfaces.

[132] Meanwhile, the cover projection device 150 and the projection devices 320 for the
"other projection surfaces" included in the two or more projection devices are separated from each other because the projection surfaces on which images are projected by them are different from each other, but may be configured with similar hardware. For example, the projection devices may be implemented in various ways, such as by using a cathode ray tube (CRT), using a liquid crystal display (LCD), by digital light processing (DLP) using a digital micromirror device (DMD) chip, by liquid crystal on silicon (LCoS), etc. Moreover, the projection devices may be implemented in various forms other than these ways.

[133] The additional effect device 340 is a device for implementing additional effects other than the images projected on the plurality of projection surfaces. Specifically, the additional effect device 340 is a device that adds a visual effect or adds an effect that can be perceived by other senses than sight so as to increase the immersion and reality that the audience can feel from the images. The additional effects that can be provided by the additional effect device 340 may include a visual effect (e.g., to propose a structure that matches an image), a sound effect, a wind effect, a smell effect, a fog effect, a temperature change effect, a laser effect, a light effect, a bubble effect, a water jet effect, etc. as well as various effects associated with the five senses of human.

[134] Therefore, the additional effect device 340 may comprise various devices such as a speaker, an air blower, a fragrance diffuser, a fog machine, a heater, a cooler, a laser device, a bubble generator, an LED, a water jet, etc. which can stimulate the five senses of human.

[135] Moreover, the additional effect device 340 may be configured to expose a structure that matches a reproduced image to the audience (for example, to expose a planet-shaped structure to the field of view of the audience when a planet crashing scene in the space is reproduced or to expose a remnant (e.g., a structure) of an aircraft when an aircraft crashing scene is reproduced).

[136] Meanwhile, the projection devices 320 for the "other projection surfaces" and the additional effect device 340 may be installed in various positions in the theater and may preferably be installed while being accommodated in the cover 100. Specifically, the projection devices 320 for the "other projection surfaces" and the additional effect device 340 may be installed in the form of the projection device 220 and the additional effect device 240, which are accommodated in the cover 100, as shown in FIGS. 5 and 6. Therefore, the projection devices for the "other projection surfaces" and the additional effect device are not exposed to the audience by this structure, thus further improving the immersion that the audience feels (that is, the equipments installed disorderly are not exposed to the audience, which reduces the distraction of the audience and improves the immersion of the audience).

[137] The management device 400 is a device for controlling various projection
equipments including the two or more projection devices and the additional effect device which are installed in the theater.

The management device 400 may control the operation of the above-described two or more projection devices and the operation of the additional effect device. Moreover, when the cover 100 comprises an opening 120 opened and closed by electrical control, the management device 400 may control the opening and closing operation of the opening 120. Furthermore, the management device 400 may control the operation of various devices installed in the theater other than the operation of these devices.

Moreover, the management device 400 may manage the images projected on the plurality of projection surfaces and may perform the correction of the images projected on the plurality of projection surfaces based on differences in properties of the plurality of projection surfaces.

Furthermore, the management device 400 may control the two or more projection devices to operate in synchronization with each other or may control the additional effect device to operate in synchronization with image data. In this case, the management device 400 may perform the synchronization control based on a time code of image data.

The management device 400 may be implemented with various electronic devices. The management device 400 may be implemented with a single electronic device or with several electronic devices interconnected to each other. For example, the management device 400 may be implemented in a single server or in such a manner that two or more servers are interconnected. Moreover, the management device 400 may be implemented in such a manner that a server and other electronic devices are interconnected or implemented in arithmetic units other than the server.

Moreover, the management device 400 may comprise a wired or wireless communication device and may operate in connection with external devices through a wired or wireless communication network.

Next, a theater structure in accordance with another embodiment of the present invention and a multi-projection system using the same will be described with reference to FIG. 10 (only differences will be described to avoid repetitive description, and thus the above-described technical features can be applied to the following embodiments, even without any description).

Referring to FIG. 10, in the theater structure in accordance with another embodiment of the present invention, the projection equipment is configured as a projection device 200 that perform rear projection and the cover 100 serves as a rear projection surface.

That is, in the theater structure in accordance with another embodiment of the present invention, the projection device 220 may be disposed in the cover 100 while not being exposed to the audience and project an image on the surface of the cover 100 by the
rear projection.

Therefore, it is preferable that the cover 100 included in the theater structure in accordance with another embodiment of the present invention comprises a rear screen film 160 for the rear projection as shown in FIG. 10 and it is also preferable that the cover 100 is formed of a transparent material. Moreover, according to embodiments, the rear screen film 160 itself may be used as the cover, without forming a separate cover.

Next, a theater structure in accordance with still another embodiment of the present invention and a multi-projection system using the same will be described with reference to FIG. 11 (only differences will be described to avoid repetitive description, and thus the above-described technical features can be applied to the following embodiments, even without any description).

The theater structure in accordance with still another embodiment of the present invention may be configured in a manner that the cover 100 itself can move as well as the above-described movable opening 120. For example, in the theater structure in accordance with still another embodiment of the present invention, the cover 100 may be configured to move by means of a joint connector (and an actuator), for example.

Therefore, in this embodiment, all the projection equipments accommodated in the cover 100 can be exposed by the selective movement of the cover 100, and thus it is very easy to perform maintenance and repair of the projection equipments.

Meanwhile, the projection equipments such as the projection device 200, etc. accommodated in the cover 100 may be configured to move by means of a connecting frame (e.g., a batten, etc.) and may move in synchronization with the movement of the cover 100 or independently.

The invention has been described in detail with reference to preferred embodiments thereof. However, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.
Claims

[Claim 1] A theater structure comprising:
a projection equipment installed in a theater; and
a cover for preventing the projection equipment from being exposed to
an auditorium,
wherein an image is projected on the surface of the cover.

[Claim 2] The theater structure of claim 1, wherein the projection equipment is
installed on a wall surface, a floor surface, or a ceiling surface of the
theater and the cover prevents the wall surface, the floor surface, or the
ceiling surface and the projection equipment from being exposed.

[Claim 3] The theater structure of claim 2, wherein the projection equipment is
installed on the ceiling surface and the cover comprises a dome-shaped
surface.

[Claim 4] The theater structure of claim 1, wherein the cover comprises an optical
coating layer formed on the surface thereof.

[Claim 5] The theater structure of claim 1, wherein the theater comprises a
projection surface installed therein and synchronized images are
projected on the surface of the cover and the projection surface.

[Claim 6] The theater structure of claim 5, wherein images corrected in different
ways are projected on the projection surface and the surface of the
cover.

[Claim 7] The theater structure of claim 6, wherein the correction is based on a
difference in surface morphology, a difference in surface chromaticity,
a difference in surface brightness, or a difference in surface reflectance.

[Claim 8] The theater structure of claim 1, wherein the projection equipment is a
projection device, the projection device projecting an image on the
cover by rear projection.

[Claim 9] The theater structure of claim 8, wherein the cover comprises a rear
screen film for the rear projection.

[Claim 10] The theater structure of claim 1, wherein the cover prevents all or part
of the projection equipment from being exposed.

[Claim 11] The theater structure of claim 10, wherein the cover comprises an
opening for exposing part of the projection equipment.

[Claim 12] The theater structure of claim 11, wherein the projection equipment is a
projection device, the projection device projecting an image on the
projection surface through the opening.

[Claim 13] The theater structure of claim 11, wherein the opening is opened and
closed by electrical control.

[Claim 14] The theater structure of claim 11, wherein the projection equipment is an additional effect device, the additional effect device being exposed to the auditorium through the opening at a predetermined time.

[Claim 15] The theater structure of claim 1, wherein the cover has colors in gradation formed on an outer edge thereof.

[Claim 16] The theater structure of claim 15, wherein the colors in gradation are formed based on a color of the cover and a color of an adjacent projection surface.

[Claim 17] A theater comprising:
   a projection equipment installed in the theater; and
   a cover for preventing the projection equipment from being exposed to an auditorium.

[Claim 18] A multi-projection system comprising:
   a projection surface on which an image is projected; and
   a cover for preventing a projection equipment installed in a theater from being exposed to an auditorium,
   wherein synchronized images are projected on the surface of the cover and the projection surface.

[Claim 19] The multi-projection system of claim 18, wherein the cover comprises an optical coating layer formed on the surface thereof.

[Claim 20] The multi-projection system of claim 18, wherein images corrected in different ways are projected on the surface of the cover and the projection surface.
[Fig. 1]

STRUCTURAL SURFACE (CEILING SURFACE, WALL SURFACE, FLOOR SURFACE)

LIGHT-EMITTING DEVICE

LIGHT-EMITTING DEVICE

SKELETAL FRAME

SPEAKER

SMOOTH IMAGE IS HARD TO BE IMPLEMENTED

PROJECTION DEVICE
[Fig. 2]

STRUCTURAL SURFACE (CEILING SURFACE, WALL SURFACE, FLOOR SURFACE)

PROJECTION EQUIPMENT (PROJECTION DEVICE, SPEAKER, LIGHT-EMITTING DEVICE, ETC.)

IMAGE IS PROJECTED ON COVER SURFACE

COVER PROJECTION DEVICE
[Fig. 3]

STRUCTURAL SURFACE (CEILING SURFACE, WALL SURFACE, FLOOR SURFACE)

PROJECTION EQUIPMENT (PROJECTION DEVICE, SPEAKER, FRAME STRUCTURE, ETC.)

IMAGE IS PROJECTED ON DOME-SHAPED SURFACE
[Fig. 4]

STRUCTURAL SURFACE (CEILING SURFACE, WALL SURFACE, FLOOR SURFACE)

PROJECTION EQUIPMENT (PROJECTION DEVICE, SPEAKER, LIGHT-EMITTING DEVICE, ETC.)

100

200

110 (OPTICAL COATING LAYER)

150
[Fig. 5]

STRUCTURAL SURFACE (CEILING SURFACE, WALL SURFACE, FLOOR SURFACE)
A. CLASSIFICATION OF SUBJECT MATTER
G03B 21/56(2006.01)i, G03B 35/20(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G03B 21/56; H04N 13/00; B61D 37/00; G03B 21/58; G03B 21/14; G03B 21/00; H04N 13/04; G03B 35/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: theater, cover, project

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search
21 March 2014 (21.03.2014)

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