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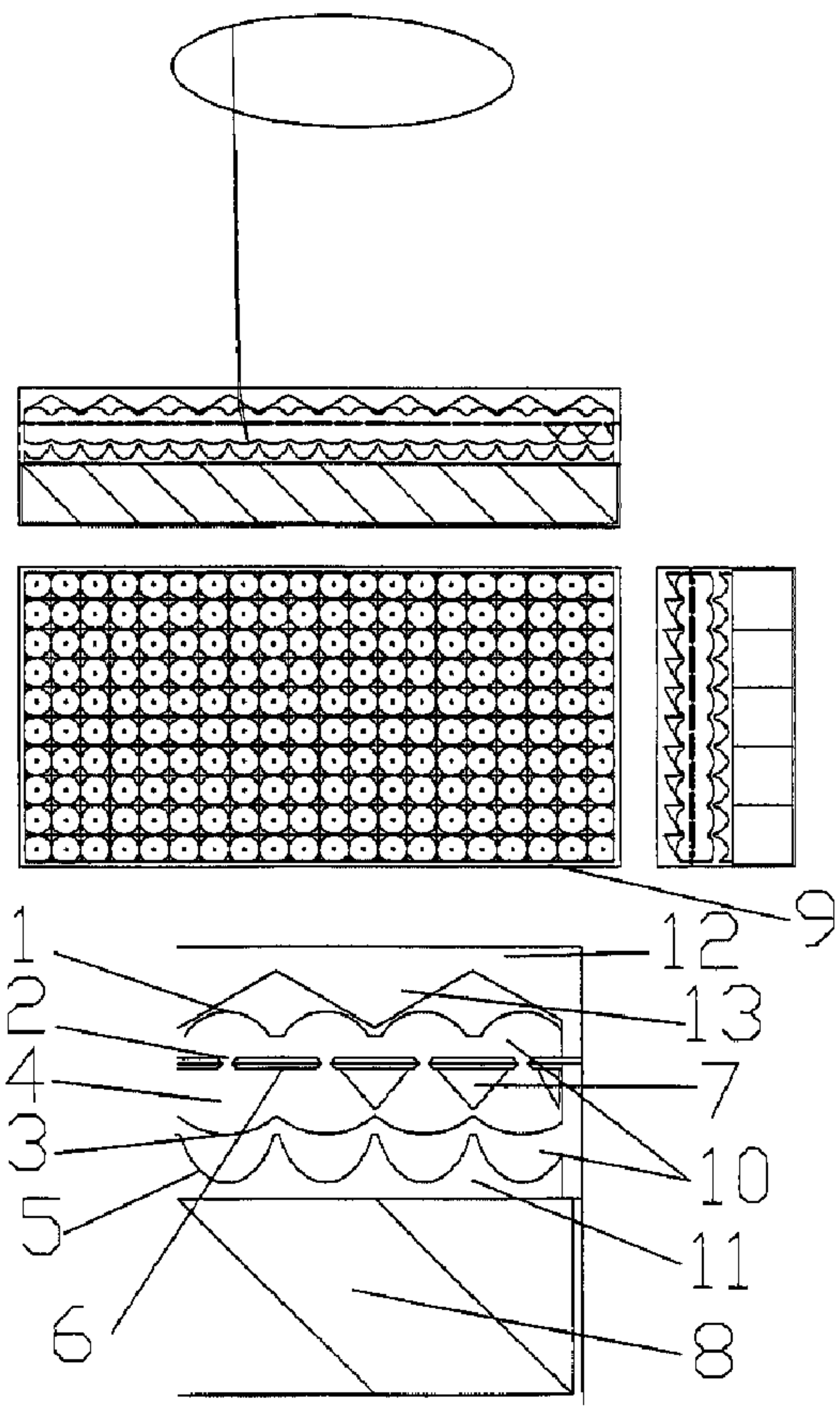
(54) Title: HOLOGRAPHIC SYSTEM FOR LARGE IMAGE PRODUCTION



(57) Abrégé/Abstract:
This invention concerns a process for producing a large holographic image of an object, consisting of a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other. In each individual projector a diaphragm (2), at least one chamber (4) for containing an optical liquid substance, a photoelectrically coated curved developing surface (31),

(57) Abrégé(suite)/Abstract(continued):
and at least one lens surface (1) are arranged so that an image of an object lying in front is put on the imaging surface (3). Each imaging surface (3) is exposed individually with an image in computer-calculated perspective and adapted to the lens system when the elements described above are correspondingly arranged and when the exposure and reproduction projectors are suitably separated. The photoelectrically coated imaging surfaces (3) are developed via an opening. The projectors are illuminated from behind by parallel light. Intermediate spaces are filled by the optical media or emptied and additional lens surfaces (5) are so arranged that they bundle or scatter the parallel light arriving from behind in order to shine through the image on the imaging surface (3) and to project it into the room.

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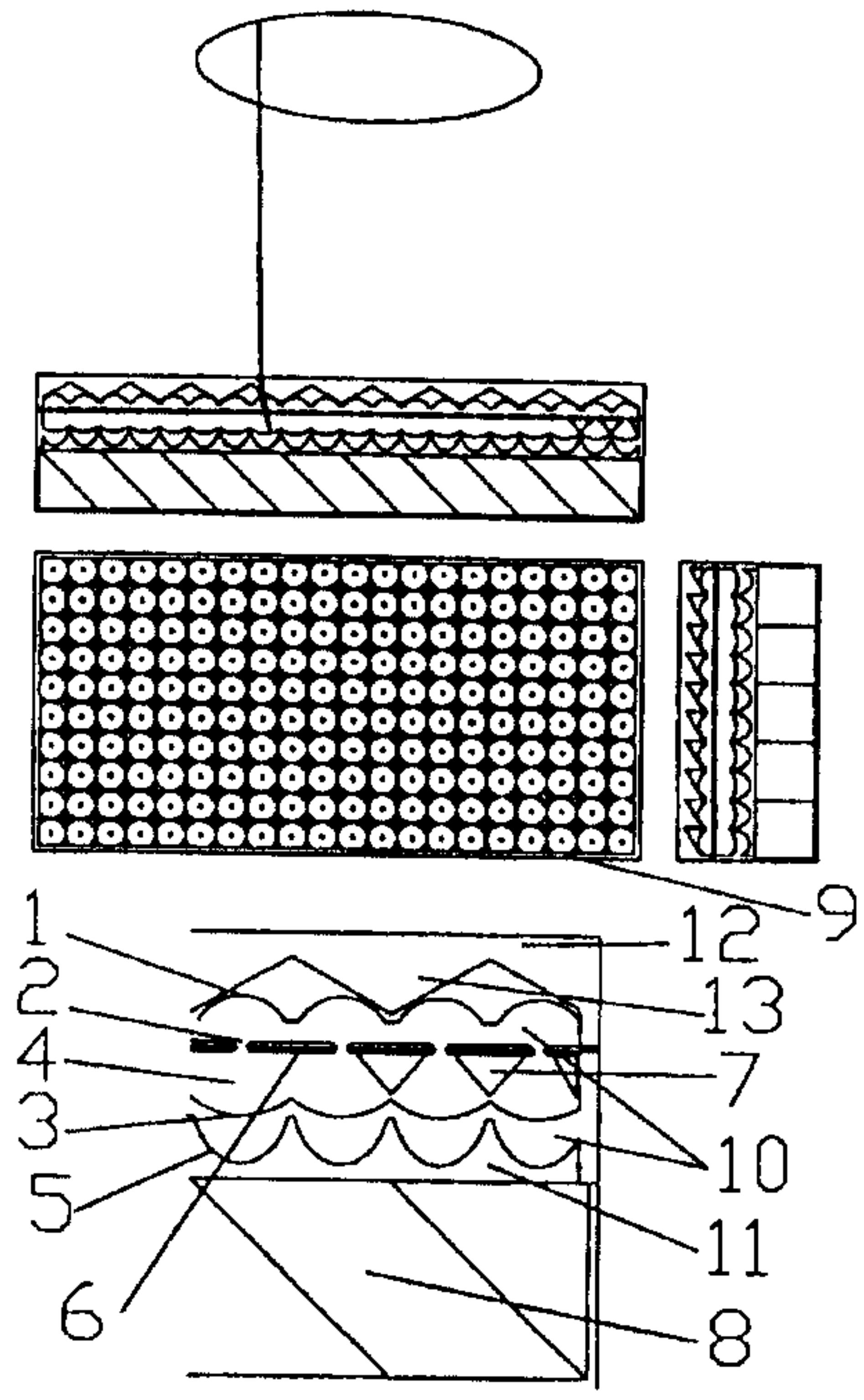
(54) Title: HOLOGRAPHIC SYSTEM FOR LARGE IMAGE PRODUCTION

(54) Bezeichnung: HOLOGRAPHISCHES GROSSBILD-ERZEUGUNGSSYSTEM

(57) Abstract

This invention concerns a process for producing a large holographic image of an object, consisting of a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other. In each individual projector a diaphragm (2), at least one chamber (4) for containing an optical liquid substance, a photoelectrically coated curved developing surface (31), and at least one lens surface (1) are arranged so that an image of an object lying in front is put on the imaging surface (3). Each imaging surface (3) is exposed individually with an image in computer-calculated perspective and adapted to the lens system when the elements described above are correspondingly arranged and when the exposure and reproduction projectors are suitably separated. The photoelectrically coated imaging surfaces (3) are developed via an opening. The projectors are illuminated from behind by parallel light. Intermediate spaces are filled by the optical media or emptied and additional lens surfaces (5) are so arranged that they bundle or scatter the parallel light arriving from behind in order to shine through the image on the imaging surface (3) and to project it into the room.



(57) Zusammenfassung

Verfahren zur Erzeugung eines holographischen Grossbildes eines Gegenstandes, umfassend eine Mehrzahl horizontal nebeneinander und vertikal übereinander rasterartig angeordneter Bildprojektoren. In jedem einzelnen Projektor werden eine Blende (2), mindestens ein Raum (4) zur Ausfüllung eines flüssigen optischen Mediums, eine fotobeschichtete gekrümmte Ausbildungsfläche (31) und mindestens eine Linsenoberfläche (1) so angeordnet, dass ein Bild von einem davor liegenden Objekt auf die Abbildungsfläche (3) gebracht wird. Bei entsprechender Anordnung der oben beschriebenen Elemente und Teilung in Aufnahme- und Wiedergabeprojektor wird jede Abbildungsfläche einzeln mit einem vom Computer ausgerechneten perspektivischen und an die Optik angepassten Bild belichtet. Die fotobeschichteten Abbildungsflächen (3) werden über einen Zugang entwickelt. Die Projektoren werden mit parallelem Licht von hinten bestrahlt. Zwischenräume werden mit optischen Medien gefüllt oder entleert und weitere Linsenoberflächen (5) so angeordnet, dass sie von hinten kommendes paralleles Licht bündeln oder streuen, um das Bild auf der Abbildungsfläche (3) zu durchstrahlen und in den Raum zu projizieren.

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Holographic system for large image production

The invention concerns a process for producing a large holographic image of an object, consisting of a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other, as well as a device for the implementation of this process. The invention also concerns a device and a process, by which three-dimensional virtual objects are presented in front of a projection screen, which can be viewed from different angles without the aid of special glasses. These are suitable especially for large-area projections and projections with high light intensity for advertisement and entertainment.

Processes for the holographic image production are known. In the stereography two images are taken or calculated slightly offset from each other. These must be delivered to the respective eye of the observer separately. The observer has to look through a device or glasses separating the image, wherein the viewing angle can not be altered.

In the laser holography a photosensitive plate is exposed with the laser beam reflected by the object and the previously split reference beam. However, the developed hologram only has a limited colour variety, it is problematic, to produce large-area projections and objects protruding far out of the image can not be realised. As the image resolution is good, this process is only suitable for smaller images.

In the cylinder-lens-plate-holography an image is split into vertical strips by the cylindrical lens plate. Thus images are brought onto normal image paper from different viewing angles of the object and can be detected from these viewing angles again. However, only a uniaxial wide-angle hologram is obtained. Above that, the protrusion of objects, the light intensity and the resolution are problematic.

It is the object of the invention, to provide a device with the associated process, to project three-dimensionally and completely holographically in wide angle large-area spatial objects far in front of an image surface with high luminous power. These are supposed to serve, among other things, for advertising and entertainment.

This object is solved by the features stated in the claims.

The main principle of the so-called integral photography has been known since the beginning of the century, but it has fallen into oblivion due to the fact, that the technical problems have not been solved sufficiently. Examples for such systems can be found in the documents D1 (US, 4 732 453, A) and D2 (US, 3 706 486, A). The main principle of the integral photography consists in that a plurality of cameras for individual images located closely one over the other and next to each other mounted on a wall can take pictures of a three-dimensional motive such, that it can be perceived spatially during the reproduction. For this the cameras only have to be small enough, but with it they have to receive the overall image from the respective position as precise as possible, retain it and project it during the reproduction as exact as possible like small slide projectors. If one regards such a projection image wall, one looks into a plurality of very small slide projectors, which merge their respective 2-D images for the observer into one large 3-D image.

The combination of camera and slide projector for exposure and reproduction of a single image has to be produced especially at low costs. In the best case hundreds of such projectors are combined in plates. On the other hand, the image taken by it has to be especially good, in order to obtain an acceptable 3-D imaging resolution in the end. The light source for the projection is relatively expensive and has to be distributed over thousands of projectors. The image module consists of different glass prisms and glass plates with lens and prism profiles. These are coated in the most different ways with reflecting layers, photosensitive layers and dereflecting layers and glued to each other. The hollow spaces are partially filled with transparent or black liquids.

The operation of one individual miniature projector will be explained in three steps (exposure, development and reproduction).

In the image exposure an object lying in front of the image module or the image of a screen is imaged onto the photosensitive imaging dish inside the projector. The beams proceeding further behind the photosensitive layer are absorbed by a black liquid, which is filled between the rear lens disks during the exposure.

The opening and closing of the diaphragm occurs outside the imaging module. If the module is exposed by a computer inside the automatic exposing machine, the module is always within chambers secured against light. The exposing device casts light only on the respective miniature projector to be exposed.

If the modules are exposed with real objects in the studio, they are mounted to a wall in the absence of light and they are all exposed together by opening a larger separating wall.

In order to achieve an optimal imaging on the photosensitive layer, the size and the position of the diaphragm, the radius of curvature and the refractive index of the front lens as well as the form of the imaging dish have to be exactly adjusted to each other, in order to compensate for the geometrical opening error, the diaphragm error caused by refraction and the astigmatism and the imaging field curvature. For modules, which are only intended for computer exposure, the imaging dish has to be adjusted to the distance of the exposure screen.

When the exposure of the module has been completed, the photoelectrically coated imaging dishes are developed via the intermediate spaces by the diapositive method. Above that, optical liquids are emptied and supplied.

In the reproduction parallel directed light shines through the miniature projectors from behind. For this laser light is the most suitable. The parallelism is important for the sharp definition of the image. In order to make the light incident exactly vertically onto all projectors at the same time, a strong light beam is guided through a channel, at which regularly partially reflecting layers reflect a fraction of the beam exactly vertically to the side. With it the main beam gets a bit weaker each time.

The vertically reflected beam impinges onto the rear aspherical lens of the projector. This is oriented such that it focuses all parallel beams arriving from behind exactly onto the diaphragm aperture. On the way thereto the beams impinge onto the imaging dish, on which the diapositive layer determines those colours, which are permitted to pass. During the radiation of this layer the respective beam fans itself into a cone by refraction of light. This can cause interference, when laser light is used. However, during the exit from the front lens the cone is guided in the parallel direction again, such that this interference is disarmed. The front glass plate with the prisms serves to align the visual field of the individual projectors alternately 20 degrees to the right or to the left and 20 degrees downwards. By this an optimal observation field is produced.

In accordance with a first broad aspect, the invention provides a process for producing a large holographic image of an object using a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other, wherein each image projector has a diaphragm, a photoelectric coated curved imaging surface, a lens having a lens surface, and an intermediate space formed by the photoelectric coated curved imaging surface and the lens surface for containing an optical liquid substance, wherein at least one lens surface of the lens surfaces is arranged so that an image of an object lying in front of the at least one lens surface is put on the photoelectric coated curved imaging surface or is exposed with a computer-generated image, wherein each photoelectric coated curved imaging surface is exposed individually with an image in computer-calculated perspective and adapted to a lens system, when exposure and reproduction projectors are suitably separated, wherein the photoelectric coated curved imaging surfaces are developed via an opening, wherein the projectors are illuminated from behind by parallel light, wherein intermediate spaces are filled by optical media or emptied and additional lens surfaces are so arranged that they bundle or scatter light arriving from behind in order to shine through an image on the imaging surface and to project the image into a room.

In accordance with a second broad aspect, the invention provides a device for producing a large holographic image of an object comprising: a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other, each of the plurality of image projectors comprising: a diaphragm; a photoelectric coated curved imaging surface; a lens having a lens surface; and an intermediate space formed by the imaging surface and the lens surface for containing an optical liquid substance; wherein at least one lens surface of the lens surfaces is arranged to produce an image of an object lying in front of the at least one lens surface on the photoelectric coated curved imaging surface or a computer-generated image, wherein each photoelectric coated curved imaging surface individually receives an image in computer-calculated perspective and is adapted to a lens system when exposure and reproduction projectors are suitably separated, wherein an opening is provided for the photoelectric coated curved imaging surfaces, wherein the plurality of imaging projectors is adapted to receive parallel light from behind onto the imaging projectors, wherein the intermediate spaces are adapted to be filled with or emptied of the optical liquid substance, and wherein additional lens surfaces are arranged to bundle or scatter parallel light arriving from behind, in order to shine through an image on the imaging surface and to project the image into a room.

The invention will be explained with regard to the drawings.

The figures 1 and 2 show schematic illustrations of the device according to the invention.

Fig. 3 is a diagrammatic illustration of the grid of prisms for the present invention.

In fig. 1 the front view of the projector wall can be seen. Thus the top view and the side view can be seen, the same applies also to the fig. 2. The reference numbers used in the figures have the following meanings:

1 spherical lenses.

2 diaphragm with a plurality of diaphragm apertures

3 a photoelectrically coated imaging surface,

4 a hollow space between imaging surface 3 and diaphragm

5 aspherical lenses

6 serves for the illustration of the locking mechanism for the diaphragm apertures 2,

7 are magnets on the diaphragms, which can be operated from the exterior by electromagnets not shown,

8 shows schematically a prism system for deviation of the light, such that the aspherical lenses 5 or the imaging surfaces 3 can be illuminated from behind

9 are the optical modules

10 are lens plates

11 refers to the prism system and

12 are optical disks,

13 are deviating prisms, by

14 a protective plate is indicated,

15 is the lens surface,

16 is the hollow space between protective plate and lens surface,

17 is the imaging surface,

19 is the hollow space between the imaging surface and

20 the lens surface 20

21 is a screen or shows an image and

18 is an exposure projector.

Fig. 3 shows with 30 the grid system 8. At 31 the inlet of the light source is to be seen. Prisms with partially reflecting layers are indicated by 32 and 33.

Referring to Figure 1, shown is a schematic illustration of a device, according to an embodiment of the invention. The device is used for producing a large holographic image of an object and has a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other. Each of the plurality of image projectors has a diaphragm 2, a photoelectric coated curved imaging surface 3, a lens having a lens surface 1, an intermediate space formed by the photoelectric coated curved imaging surface 3 and the lens surface 1 for containing an optical liquid substance. At least one lens surface 1 is arranged to produce an image of an object lying in from of the lens surface 1 on the photoelectric coated curved imaging surface 3 or a computer-generated image. Each photoelectric coated curved imaging surface 3 individually receives an image in computer-calculated perspective and is adapted to a lens system, when exposure and reproduction projectors are suitably separated. An opening is provided for the photoelectric coated curved imaging surfaces 3. The imaging projectors are adapted to receive parallel light from behind onto the imaging projectors. The intermediate spaces are adapted to be filled with or emptied of the optical liquid substance. Additional lens surfaces 5 are arranged to bundle or scatter parallel light arriving from behind in order to shine through an image on the photoelectric coated curved imaging surface 3 and to project the image into a room.

In some embodiments of the invention, the device has a miniature LCD (Liquid Crystal Display) suitable for substitution with the photoelectric coated curved imaging surface 3 in the projector. The miniature LCD is set by a miniature computer on a module. An image with a correct perspective is calculated by the miniature computer and the miniature computer is operatively connected with the miniature computers of adjacent modules. If necessary the miniature computer keeps its setting independent.

The lens surface 1 is a spherical lens surface at a front and a diaphragm is arranged behind the lens. Behind the lens the photoelectric coated curved imaging surface 3 corresponds to an ideal imaging dish of an optical system and is formed from a glass layer. A hollow space 4 is between a diaphragm and the photoelectric coated curved imaging surface 3. The hollow space 4 is adapted to be filled with a liquid. Behind the photoelectric coated curved imaging surface 3 a spherical lens surface 5 is arranged and is adapted to focus light arriving from behind exactly onto a diaphragm aperture.

The diaphragm plate in front of the diaphragms 2 is adapted to open and close the diaphragms 2 together by laterally displacing them. The diaphragm plate is adapted to be pushed onto the diaphragms 2 and to a side by springs. The plates are displaceable by magnets 7 attached at one side of the plate from an exterior via an electromagnet.

Referring to Figure 2, shown is another schematic illustration of the device according to another embodiment of the invention.

In the device of Figure 2 each imaging projector has a protective plate 14 at a front of the imaging projector. A front spherical lens surface 15 is arranged behind the protective plate 14, and a hollow space 16 is between a disc and the lens front spherical surface 15. The hollow space 16 is filled with a liquid optical substance only for exposure. A photoelectric coated curved imaging surface 17 corresponds to the optical properties of the exposure projector 18 and the front spherical lens surface

15 is formed on a glass layer and is coated with a photoelectric coating. An intermediate space 19 between the lens and the imaging surface 17 can be filled with a liquid. Behind the imaging surface 17 an aspherical lens surface 20 is arranged. The aspherical lens surface 20 is adapted to bundle light arriving from behind to a point and project the light forward. The exposure projector 18 is precisely controlled by a computer for the exposure and the photoelectric coated curved imaging surface 17 is exposed with an image 21 calculated in perspective and adapted to the lens system. A screen in the exposure projector 18 is curved in order to give an imaging a stronger curvature.

With reference to Figure 3, each of the image projectors is transilluminated through a grid system of prisms 8 by parallel directed light from behind the image projector.

The grid system has rhombic prisms 30 glued together at cut surfaces. The rhombic prisms 30 have a refractive index lower than a refractive index of the glue, and have completely or partially reflecting layers. A light source 31 is adapted to be uniformly distributed onto all grid squares of the grid by reflecting a fraction of a light stream travelling in a first direction by 90° at each cut surface. The light stream passes through the system a second time in a second direction opposite the first direction, after the light stream has reached a last one of the prisms.

The grid system has edge prism cells 32, 33 at an edge of the grid system that deviate a portion of the light stream by 90° in a main light by 90° in the plane and simultaneously vertically deviate a separated weaker light stream by 90° to the first plane in a second plane. The edge prism cells 32, 33 are formed by cutting the prism twice diagonally into four pieces and gluing the four pieces together again, and by depositing fully and partially reflecting layers at four cut surfaces and outer surfaces.

The image projectors are combined in rectangular modules 9 and the lenses are combined in lens plates 10. The lens plates 10 are glued to retaining straps between the lenses. Lockable apertures 25 give access to the intermediate space in order to enable the filling in of photographic developing chemicals or optical substances. Rectangular modules 9 are for example 10 x 20 cm.

A space between the spherical lens surface 20 and the present system 11 is filled with an opaque dark liquid prior to development in order to avoid interfering reflections during exposure.

An optical plate 12 is arranged in front of the image projectors and is adapted to provide a deviating prism 13 in front of each lens. Alternating prism deviations to the right and to the left and downwards align an optical visual field. The prisms have a slight curvature at one side in order to compensate for a slight distortion. Colours red, green, and blue are always alternatively fed through colour filters to a separate image projector and the photoelectric coated curved imaging surfaces 17. The lenses and photoelectric coating are optimally adjusted to a respective wavelength.

Each image projector receives a whole colour spectrum and the photoelectric coated curved imaging surfaces, the lenses, and the photoelectric coatings are adjusted to all wavelengths.

In some embodiments of the invention, a lens disc with several lenses is arranged in front of each image projector in order to increase the point resolution.

In some embodiments of the invention, the devices of Figures 2 and 3 are adapted for production of an image inverted in perspective (pseudoskopic) of an object. Such a device has a plurality of individual deviating bodies arranged to a filter wall in the grid horizontally next to each other and vertically one over the other. Each deviating body consists of a glass body, in which two mirror surfaces cutting each other vertically are embedded. The mirror surfaces stand vertical towards the filter wall and are provided with a diaphragm aperture at an intersection point.

In some embodiments of the invention, a filter wall disc is suspended edgewise between two discs with a lubricating agent such that the filter wall disc is easily moveable, in order to increase a resolution in an exposure.

In some embodiments of the invention, the imaging surface is a mirror, onto which a photosensitive layer is deposited. In reproduction the strong light source shines obliquely from the front onto the mirrors, in order to project images on the mirror surface into the room. During exposure by a single point exposure a computer calculates the image with regard to the position of the reproduction light source.

As an automatic exposing machine, image modules are automatically taken from a reservoir. The image modules are put on a precision track and are automatically guided by a computer in front of an objective of a large exposure screen. The computer calculates the image, opens and closes a projector diaphragm and continues with a next image projector.

As an automatic developing machine, undeveloped image modules are automatically taken from a reservoir and are developed in the absence of light. Liquid substances in the module are correspondingly emptied and filled and sequentially developing chemicals and rinses are introduced. The modules are sealed, marked as developed, and are pushed into the reservoir, in order to continue with a next module.

In some embodiments of the invention, the lens surface 15 used for the bundling of incident object beams and the aspherical lens surfaces 20 used for the bundling of the projection light arriving from behind form two or more lenses having a shape and a refractive index adapted to largely correct a colour error, opening error and further imaging error.

In some embodiments, the invention provides a process for producing a large holographic image of an object using a plurality of image projectors locating in a grid horizontally next to each other and vertically one over the other. Such image projectors are found for example in Figure 1. At least one of the lens surfaces 1 is arranged so that an image an object lying in front of the lens surface is put on the photoelectric coated curved imaging surface 3 or is exposed with a computer-generated image. Each imaging surface is exposed individually with an image in computer-calculated perspective and adapted to a lens system, when exposure and reproduction projectors are suitably separated. The photoelectric coated curved imaging surfaces 3 are developed via an opening. The projectors are illuminated from behind by parallel light. Intermediate spaces are filled by optical media or emptied and additional lens surfaces 5 are arranged so that they bundle or scatter light arriving from behind in order to shine through an image on the photoelectric coated curved imaging surface 3 and to project the image into a room.

In some embodiments of the invention, the above process is adapted for memory of several images on the photoelectric coated curved imaging surfaces 3 and for reproduction of a short cycle movement sequence of an overall image scene. The photoelectric coated curved imaging surface 3 is coated with a plurality of different photosensitive layers. Three layers (RBG) for each individual image are exposed during exposure and are read out during the reproduction, without exposing or reading out of other ones of the photosensitive layers. The three layers are brought to sensitization or reading out by a property of the light or other signals.

In some embodiments of the invention, each of the photosensitive layers reacts photosensitively to a narrow spectrum of respective different wavelengths with higher resolving power. In a three-fold RGB-separated exposure of an individual image only those wavelengths are employed respectively, on which the layers associated with the individual image react. During photographic development the photosensitive layer reacting on a certain wavelength obtains a pigmentation, which also absorbs exactly the certain wavelength with high resolution power. During reproduction a wall with RGB-components is transilluminated, which correspond in their wavelength to a respective image to be illustrated.

CLAIMS:

1. Process for producing a large holographic image of an object using a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other, wherein each image projector has a diaphragm, a photoelectric coated curved imaging surface, a lens having a lens surface, and an intermediate space formed by the photoelectric coated curved imaging surface and the lens surface for containing an optical liquid substance, wherein at least one lens surface of the lens surfaces is arranged so that an image of an object lying in front of the at least one lens surface is put on the photoelectric coated curved imaging surface or is exposed with a computer-generated image, wherein each photoelectric coated curved imaging surface is exposed individually with an image in computer-calculated perspective and adapted to a lens system, when exposure and reproduction projectors are suitably separated, wherein the photoelectric coated curved imaging surfaces are developed via an opening, wherein the projectors are illuminated from behind by parallel light, wherein intermediate spaces are filled by optical media or emptied and additional lens surfaces are arranged so that they bundle or scatter light arriving from behind in order to shine through an image on the photoelectric coated curved imaging surface and to project the image into a room.

2. Process according to claim 1 for memory of several images on the photoelectric coated curved imaging surfaces and for reproduction of a short cyclic movement sequence of an overall image scene, wherein the photoelectric coated curved imaging surface is coated with a plurality of different photosensitive layers, wherein three layers for each image are exposed during the exposure and are read onto during the reproduction, without exposing or reading out the

other layers, and wherein the three layers are brought to sensitization or reading out by a property of the light or other signals.

3. Process according to claim 2 wherein each of the photosensitive layers reacts photosensitively only to a narrow spectrum of respective different wavelengths with high resolving power, wherein in a three-fold RGB-separated exposure of an individual image only those wavelengths are employed respectively, on which the layers associated with the individual image react, wherein during photographic development the photosensitive layer reacting on a certain wavelength obtains a pigmentation, which also absorbs exactly the certain wavelength with high resolution power, and wherein during the reproduction a wall with RGB-components is transilluminated, which correspond in their wavelength to a respective image to be illustrated.

4. Device for producing a large holographic image of an object, the device comprising:

a plurality of image projectors located in a grid horizontally next to each other and vertically one over the other, each of the plurality of image projectors comprising:

a diaphragm;

a photoelectric coated curved imaging surface;

a lens having a lens surface; and

an intermediate space formed by the photoelectric coated curved imaging surface and the lens surface for containing an optical liquid substance;

wherein at least one lens surface of the lens surfaces is arranged to produce an image of an object lying in front of the at least one lens surface on the photoelectric coated curved imaging surface or a computer-generated image,

wherein each photoelectric coated curved imaging surface individually receives an image in computer-calculated perspective and is adapted to a lens system, when exposure and reproduction projectors are suitably separated,

wherein an opening is provided for the photoelectric coated curved imaging surfaces,

wherein the plurality of imaging projectors is adapted to receive parallel light from behind onto the plurality of imaging projectors,

wherein the intermediate spaces are adapted to be filled with or emptied of the optical liquid substance, and

wherein additional lens surfaces are arranged to bundle or scatter parallel light arriving from behind, in order to shine through an image on the photoelectric coated curved imaging surface and to project the image into a room.

5. Device according to claim 4, comprising a miniature LCD for substitution with the photoelectric coated curved imaging surface in the projector, the miniature LCD being set by a miniature computer on a module and wherein an image with a correct perspective is calculated by the miniature computer and the miniature computer is operatively connected with the miniature computers of adjacent modules.

6. Device according to claim 5 wherein the miniature computer keeps the setting independent.

7. Device according to claim 4, wherein the at least one lens surface comprises a spherical lens surface at a

front of the projector, wherein a diaphragm is arranged behind the lens, wherein behind the lens the photoelectric curved imaging surface corresponds to an ideal imaging dish of an optical system and is formed from a glass layer, wherein a hollow space is between a diaphragm and the photoelectric coated curved imaging surface, the hollow space being adapted to be filled with a liquid, and wherein behind the photoelectric coated curved imaging surface an aspherical lens surface is arranged and adapted to focus light arriving from behind exactly onto a diaphragm aperture.

8. Device according to claim 7, wherein a diaphragm plate in front of the diaphragms is adapted to open and close the diaphragms together by laterally displacing them, the plate being adapted to be pushed onto the diaphragms and to a side by springs, and wherein the plates are displaceable by magnets attached at one side of the plate from an exterior via an electromagnet.

9. Device according to claim 4, wherein each imaging projector has a protective plate at a front of the imaging projector, the at least one lens surface comprising a front spherical lens surface arranged behind the protective plate, wherein a hollow space is between a disk and the lens, the hollow space being filled with a liquid optical substance only for exposure, wherein the photoelectric coated curved imaging surface corresponds to the optical properties of the exposure projector and the front spherical lens surface is formed on a glass layer and is coated with a photoelectric coating, wherein another hollow space between the lens and the photoelectric coated curved imaging surface can be filled with a liquid, wherein behind the photoelectric coated curved imaging surface an aspherical lens surface is arranged, the aspherical lens surface being adapted to

bundle light arriving from behind to a point and project the light forward, wherein the exposure projector is precisely controlled by a computer for the exposure and the photoelectric coated curved imaging surface is exposed with an image calculated in perspective and adapted to the lens system, and wherein a screen in the exposure projector is curved, in order to give an imaging a stronger curvature.

10. Device according to any one of claims 4 to 9, wherein each of the image projectors is transilluminated through a grid system of prisms by parallel directed light from behind the image projector.

11. Device according to claim 10, wherein the grid system, comprises rhombic prisms glued together at cut surfaces, the rhombic prisms having an optical medium with a lower refractive index than a refractive index of the glue and having completely or partially reflecting layers; and wherein a light of a source is adapted to be relatively uniformly distributed onto all grid squares of the grid by reflecting a fraction of a light stream travelling in a first direction by 90° at each cut surface, and wherein the light stream passes through the system a second time in a second direction opposite the first direction, after the light stream has reached a last one of the prisms.

12. Device according to any one of claims 10 and 11, wherein the grid system has edge prism cells at an edge of the grid system that deviate a main light stream by 90° in a first plane and simultaneously vertically deviate a separated weaker light stream by 90° to the first plane in a second plane, the edge prism cells being formed by cutting a prism twice diagonally into four pieces and gluing the four pieces together again, and by depositing fully and partially reflecting layers at four cut surfaces and outer surfaces.

13. Device according to any one of claims 4 to 12, wherein the image projectors are combined in rectangular modules wherein the lenses are combined in lens plates, the lens plates being glued to retaining straps between the lenses, wherein lockable apertures give access to the intermediate space in order to enable the filling in of photographic developing chemicals or optical substances.

14. Device according to claim 13, wherein the rectangular modules are 10 x 20 cm^2.

15. Device according to any one of claims 7 and 8, wherein a space between the aspherical lens surface and a prism system is filled with an opaque dark liquid prior to development in order to avoid interfering reflections during exposure.

16. Device according to any one of claims 4 to 15, wherein an optical plate is arranged in front of the image projectors and adapted to provide a deviating prism in front of each lens, wherein alternating prism deviations to the right and to the left and downwards align an optimal visual field, and that the prisms comprise a curvature at one side in order to compensate for a distortion.

17. Device according to any one of claims 4 to 15, wherein colours red, green and blue are always alternatively fed through colour filters to a separate image projector and wherein the photoelectric coated curved imaging surfaces, the lenses and photoelectric coatings are optimally adjusted to a respective wavelength.

18. Device according to any one of claims 4 to 17, wherein each image projector receives a whole colour spectrum and wherein the photoelectric coated curved imaging

surfaces, the lenses and the photoelectric coatings are adjusted to all wavelengths.

19. Device according to any one of claims 4 to 18, wherein a lens disk with several lenses is arranged in front of each image projector in order to increase a point resolution.

20. Device according to any one of claims 4 to 19 for production of an image inverted in perspective of an object, comprising a plurality of individual deviating bodies arranged to a filter wall in a grid horizontally next to each other and vertically one over the other, wherein each deviating body consists of a glass body, in which two mirror surfaces cutting each other vertically are embedded, the mirror surfaces standing vertically towards the filter wall and being provided with a diaphragm aperture at an intersection point.

21. Device according to claim 20, wherein a filter wall disk is suspended edgewise between two disks with a lubricating agent such that the filter wall disk is movable, in order to increase a resolution in an exposure.

22. Device according to any one of claims 4 to 21, wherein the imaging surface is a mirror, onto which a photosensitive layer is deposited, wherein in reproduction a strong light source shines obliquely from the front on to the mirrors, in order to project images on the mirror surface into the room, and wherein during exposure by a single point exposure a computer calculates the image with regard to the position of the reproduction light source.

23. Device according to any one of claims 13 and 14, wherein as an automatic exposing machine image modules are automatically taken from a reservoir, the image modules are

put on a precision track and are automatically guided by a computer in front of an objective of a large exposure screen, wherein the computer calculates the image, opens and closes a projector diaphragm and continues with a next image projector.

24. Device according to any one of claims 13 and 14, wherein as an automatic developing machine undeveloped image modules are automatically taken from a reservoir and are developed in the absence of light, wherein liquid substances in the module are correspondingly emptied and filled and sequentially developing chemicals and rinses are introduced, the modules are sealed, are marked as developed and are pushed into the reservoir, in order to continue with a next module.

25. Device according to any one of claims 4 to 6, wherein the at least one lens surface comprises front lens surfaces for bundling of incident object beams, the device comprising rear aspherical lens surfaces for bundling of the projection light arriving from behind forming two or more lenses having a shape and a refractive index adapted to largely correct a colour error, opening error and further imaging error.

26. Device according to any one of claims 7 to 9, wherein the front spherical lens surfaces are adapted to bundle incident object beams, the front spherical lens surfaces and the aspherical lens surfaces forming two or more lenses having a shape and a refractive index adapted to largely correct a colour error, opening error and further imaging error.

Fig. 1

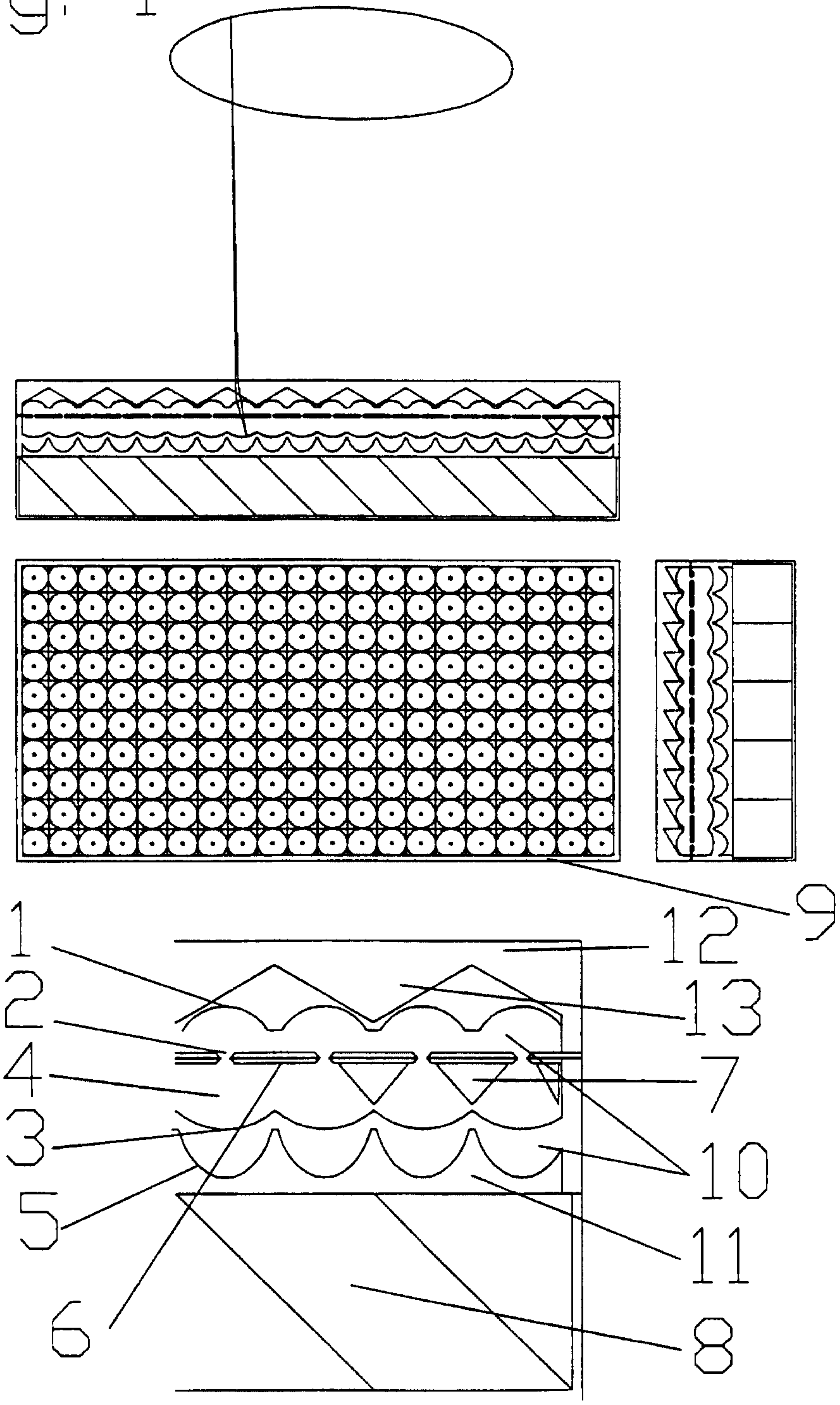


Fig. 2

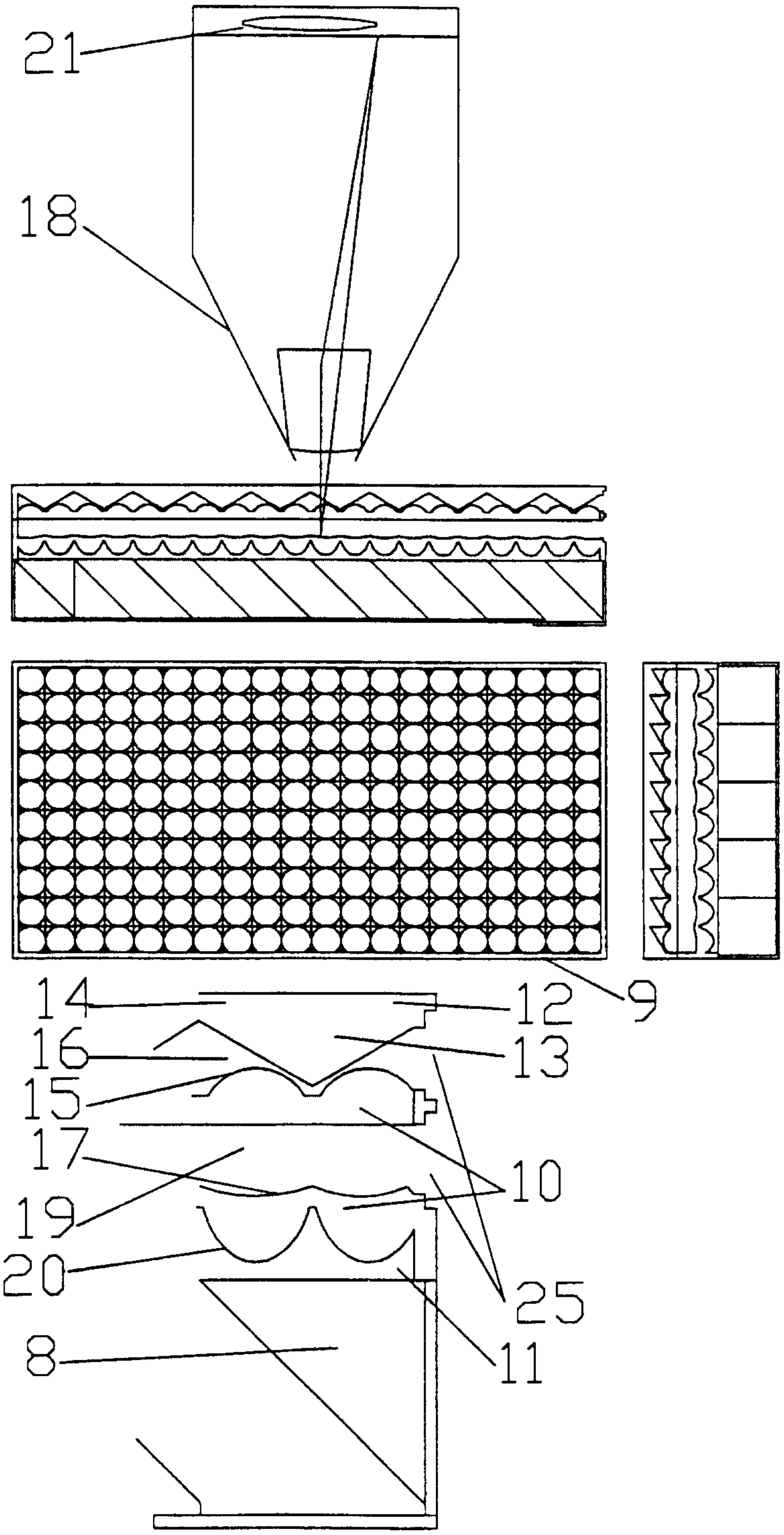
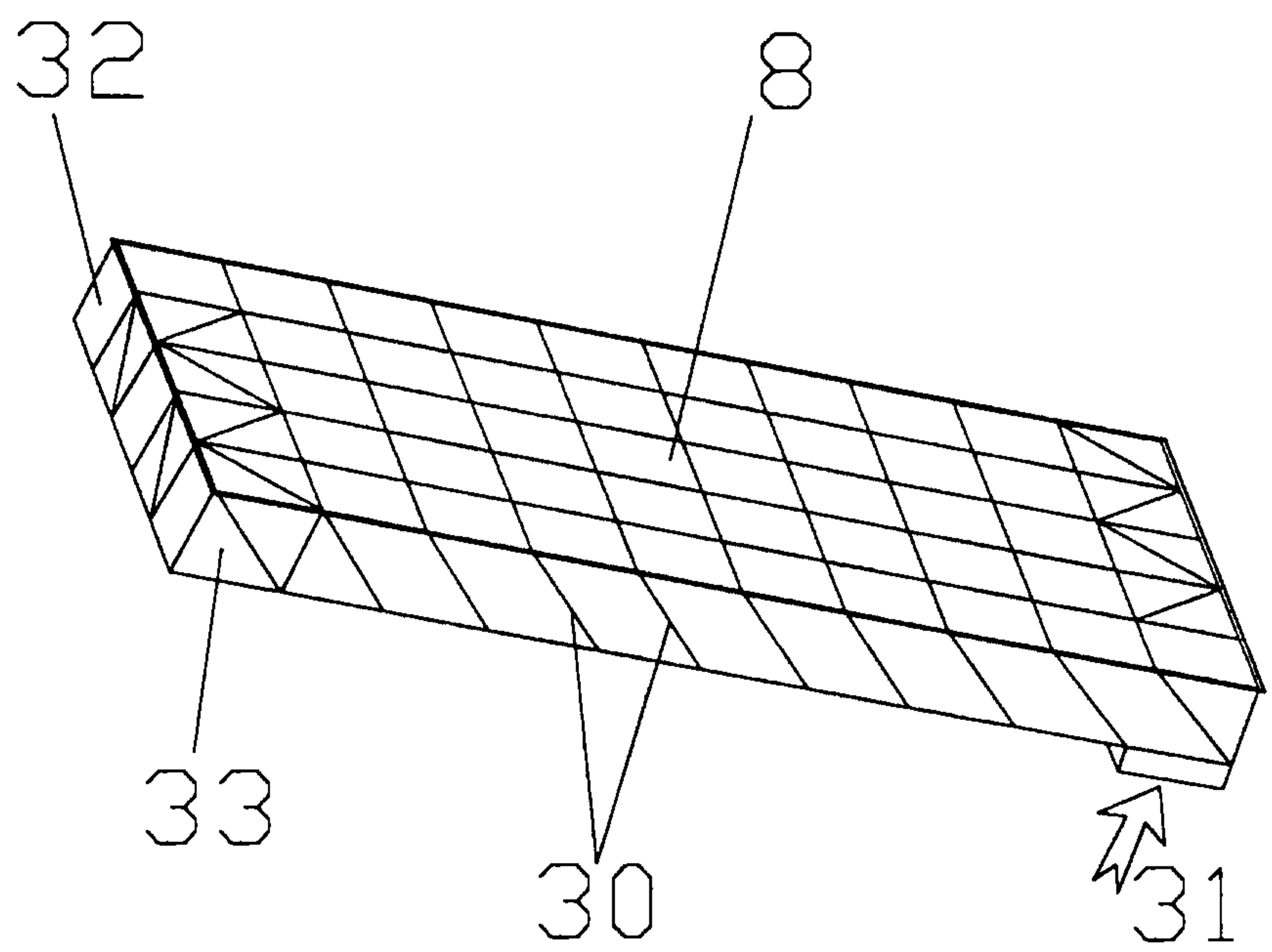
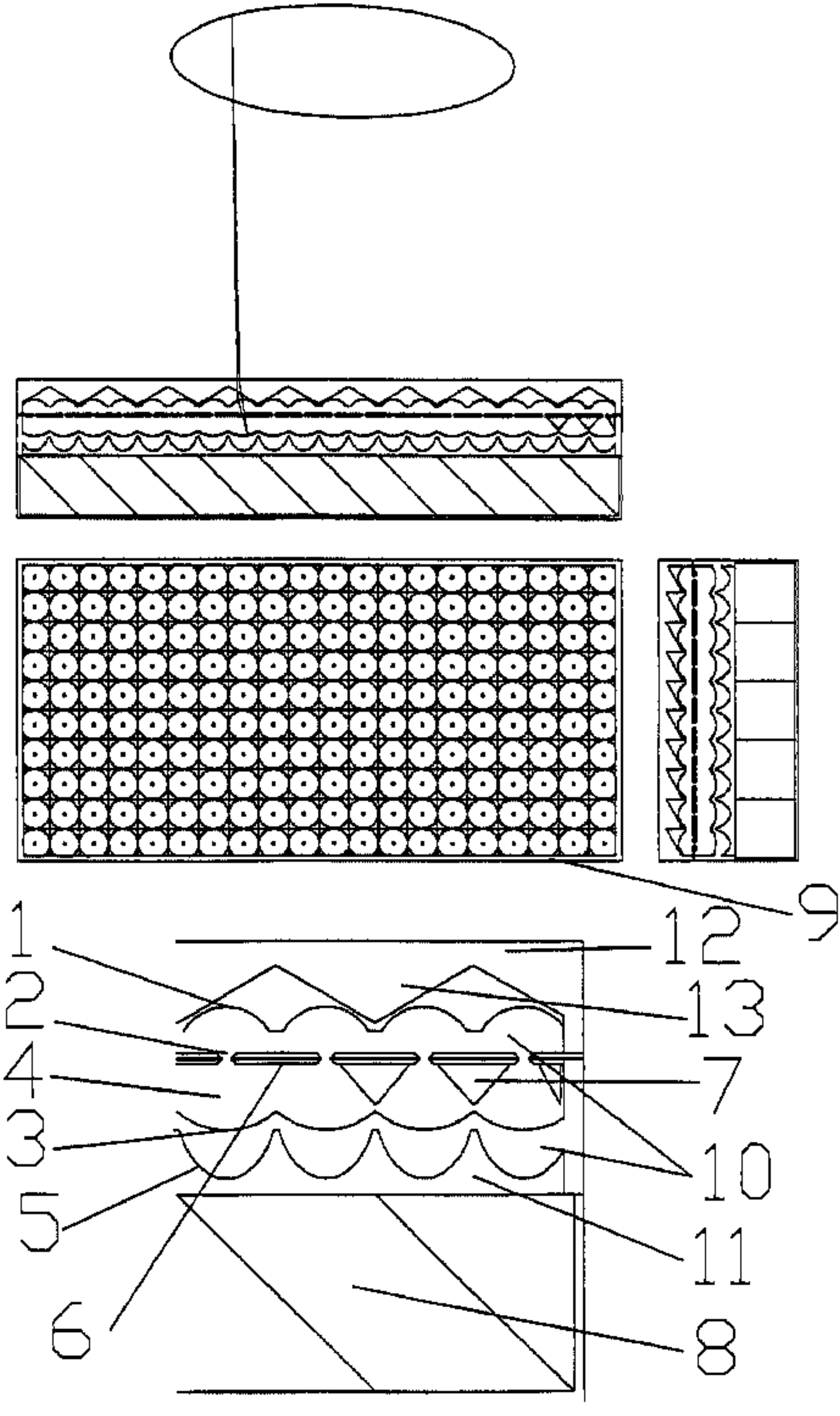


Fig. 3





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