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(54) **LIGHT SOURCE SYSTEM AND ILLUMINATION SYSTEM**

(57) The present utility model discloses a light source system and a lighting apparatus. A first light-emitting subsystem includes a laser light source array; and a wavelength conversion apparatus disposed on an output light path of the laser light source array, where the wavelength conversion apparatus includes at least one wavelength conversion area. A second light-emitting subsystem includes a first light emitting diode (LED) array disposed on an output light path of the wavelength conversion apparatus, where a light-emitting surface of the first LED array is facing away from the wavelength conversion apparatus, and the first LED array includes a first light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus. A light source shaping subsystem includes an integration lens group disposed on an output light path of the first LED array; a first condensing lens disposed on a side of the integration lens group that is facing away from the first LED array; and a moveable optical block disposed on a side of the first condensing lens that is facing away from the integration lens group, where the moveable optical block can move into or move out of an output light path of the first condensing lens. A luminous flux output is increased, and a size of an output

light spot of the light source system is switched.

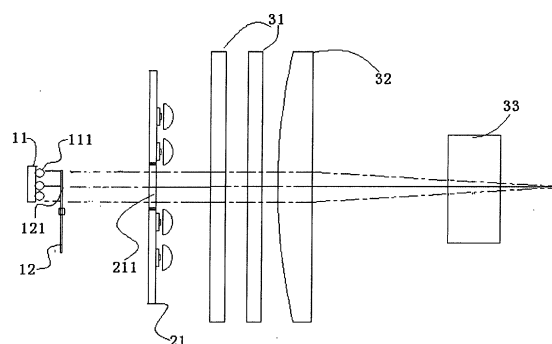


FIG. 1

## Description

### Technical Field

**[0001]** The present utility model relates to the field of lighting technologies, and more specifically, to a light source system and a lighting system.

### Related Art

**[0002]** A light emitting diode (LED) is a semiconductor solid light source that can directly convert electricity into visible light, and compared with a conventional light source, has advantages of long life, high light efficiency, no radiation, and low power consumption. With exacerbation of problems plaguing the world in recent years, such as energy shortage and climate warming, semiconductor LED light sources are becoming more universally applied to various fields, and quite tend to replace conventional light sources.

**[0003]** For a current technology, in a normal working state, a maximum luminous flux of a single LED chip (with a size of 1 mm × 1 mm) does not exceed 300 lumina (lm). For some light source systems that require a relatively high luminous flux output, an LED array may be used for implementation. However, if a luminous flux output of a light source system is required to reach that of a conventional halogen lamp (1200 W to 1500 W), a quantity of LED chips of the LED array is required to be very large, consequently causing the light source system to have a very large volume and therefore fail to be applicable to some application occasions. For example, if a luminous flux output of a stage light device using an LED array needs to reach that of the a conventional halogen lamp (1200 W to 1500 W), a volume of the stage light device is far beyond an acceptance range of a user, and consequently the stage light device cannot be used.

**[0004]** In the prior art, a laser diode (LD) has brightness that is far higher than that of an LED. Therefore, a light source system using an LD can not only have a high luminous flux output, but also have a volume that is effectively controlled. However, currently among LDs with various colors, even costs of a cheapest blue LD are far higher than that of an LED, and costs of a green LD or a red LD are far higher than that of the blue LD. Output light in an existing light source system has relatively weak green and red components and therefore needs to be enhanced. Therefore, if an LED is replaced with an LD to increase a luminous flux output of the light source system, extraordinarily expensive green and red LDs often need to be used, consequently causing costs of the light source system to be considerably increased. Therefore, in the prior art, when the light source system has a relatively high luminous flux output, a volume and costs of the light source system cannot be effectively controlled.

## SUMMARY

**[0005]** In view of this, the present utility model provides a light source system and a lighting apparatus, and mixes an LED array and a laser light source array, to complement light emission of the LED array, increase the luminous flux output, and effectively control a volume and costs of the light source system. In addition, a size of an output light spot of the light source system is switched by moving in or moving out a moveable optical block in the light source system.

**[0006]** To achieve the foregoing objective, the present utility model provides the following technical solutions:

A light source system includes: a first light-emitting subsystem, a light source shaping subsystem, and a second light-emitting subsystem located between the first light-emitting subsystem and the light source shaping subsystem, where

the first light-emitting subsystem includes a laser light source array, and the laser light source array includes at least one laser light source; and

a wavelength conversion apparatus disposed on an output light path of the laser light source array, where the wavelength conversion apparatus includes at least one wavelength conversion area;

the second light-emitting subsystem includes: a first LED array disposed on an output light path of the wavelength conversion apparatus, where a light-emitting surface of the first LED array is facing away from the wavelength conversion apparatus, and the first LED array includes a first light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus; and

the light source shaping subsystem includes an integration lens group disposed on an output light path of the first LED array;

a first condensing lens disposed on a side of the integration lens group that is facing away from the first LED array; and

a moveable optical block disposed on a side of the first condensing lens that is facing away from the integration lens group, where the moveable optical block can move into or move out of an output light path of the first condensing lens.

**[0007]** Preferably, the first light-emitting subsystem further includes:

a reflector disposed on a light-emitting light path of the laser light source, configured to reflect laser light

emitted by the laser light source; and

a color separation apparatus that is disposed on a reflection light path of the reflector and is located between the wavelength conversion apparatus and the first light transmitting hole, configured to: reflect the laser reflected by the reflector to any wavelength conversion area of the wavelength conversion apparatus, and transmit the excited light that is emitted by the wavelength conversion area when being excited by the laser light to the first light transmitting hole.

**[0008]** Preferably, the first light-emitting subsystem further includes:

a first collimating lens that is disposed on the light-emitting light path of the laser light source and is located between the laser light source and the reflector; and

a second condensing lens disposed between the wavelength conversion apparatus and the color separation apparatus.

**[0009]** Preferably, the first LED array includes:

a plurality of LED chips; and

a second collimating lens disposed on a light-emitting light path of the LED chips.

**[0010]** Preferably, the second light-emitting subsystem further includes:

a heat pipe substrate that is disposed on the back of the first LED array and is located between the first LED array and the first light-emitting subsystem, where the first light transmitting hole penetrates the heat pipe substrate.

**[0011]** Preferably, the second light-emitting subsystem further includes:

a second LED array and a third LED array these are respectively disposed on two sides of the first LED array and are disposed perpendicular to the first LED array, where light-emitting colors of the first LED array, the second LED array, and the third LED array are different; and

a light combination apparatus disposed between the second LED array and the third LED array.

**[0012]** Preferably, the light combination apparatus includes:

a first dichroic filter and a second dichroic filter that are disposed in an X shape, where

the first dichroic filter reflects the light emitted by the

second LED array to the integration lens group, and the first dichroic filter transmits light emitted by the first LED array and the third LED array; the second dichroic filter reflects the light emitted by the third LED array to the integration lens group, and the second dichroic filter transmits the light emitted by the first LED array and the second LED array.

**[0013]** Preferably, the light combination apparatus further includes a second light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus.

**[0014]** Preferably, the moveable optical block includes:

a lens barrel;

at least one third condensing lens disposed inside the lens barrel; and

a rotation shaft permanently connected to the lens barrel, where the rotation shaft is configured to drive the lens barrel to rotate into or rotate out of the output light path of the first condensing lens.

**[0015]** Correspondingly, the present utility model further provides a lighting system, where the lighting system includes the light source system.

**[0016]** Compared with the prior art, the technical solutions provided by the present utility model have at least the following advantages:

The present utility model provides a light source system and a lighting apparatus, including: a first light-emitting subsystem, a light source shaping subsystem, and a second light-emitting subsystem located between the first light-emitting subsystem and the light source shaping subsystem, where the first light-emitting subsystem includes a laser light source array, and the laser light source array includes at least one laser light source; and a wavelength conversion apparatus disposed on an output light path of the laser light source array, where the wavelength conversion apparatus includes at least one wavelength conversion area; the second light-emitting subsystem includes: a first LED array disposed on an output light path of the wavelength conversion apparatus, where a light-emitting surface of the first LED array is facing away from the wavelength conversion apparatus, and the first LED array includes a first light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus; and the light source shaping subsystem includes an integration lens group disposed on an output light path of the first LED array; a first condensing lens disposed on a side of the integration lens group that is facing away from the first LED array; and a moveable optical block disposed on a side of the first condensing lens that is facing away from the integration lens group, where the moveable optical block can move into or move out of an output light path of the first condensing lens.

[0017] It can be learned from the foregoing content that, the technical solutions provided by the present utility model mix an LED array and a laser light source array, to complement light emission of the LED array, increase a luminous flux output, and effectively control a volume and costs of the light source system. In addition, a size of an output light spot of the light source system is switched by moving in or moving out a moveable optical block in the light source system.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0018] To describe the technical solutions in the embodiments of the present utility model or the prior art more clearly, the following briefly describes the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description show merely some embodiments of the present utility model, and persons of ordinary skill in the art may still derive other drawings from the provided accompanying drawings without creative efforts.

FIG. 1 is a schematic structural diagram of a light source system according to an embodiment of this application;

FIG. 2 is a schematic structural diagram of a first light-emitting subsystem according to an embodiment of this application;

FIG. 3 is a schematic structural diagram of a second light-emitting subsystem according to an embodiment of this application; and

FIG. 4 is a schematic structural diagram of another light source system according to an embodiment of this application.

## DETAILED DESCRIPTION

[0019] The following clearly and completely describes technical solutions in embodiments of the present utility model with reference to the accompanying drawings in the embodiments of the present utility model. Apparently, the described embodiments are some embodiments of the present utility model rather than all of the embodiments. All other embodiments obtained by persons of ordinary skill in the art based on the embodiments in the present utility model without creative effects shall fall within the protection scope of the present utility model.

[0020] As described in the related art, in the prior art, when the light source system has a relatively high luminous flux output, a volume and costs of the light source system cannot be effectively controlled.

[0021] Based on this, the embodiments of this application provide a light source system and a lighting apparatus, and mix an LED array and a laser light source array, to complement light emission of the LED array,

increase a luminous flux output, and effectively control a volume and costs of the light source system. In addition, a size of an output light spot of the light source system is switched by moving in or moving out a moveable optical block in the light source system. To achieve the foregoing objective, the technical solutions provided in the embodiments of this application are as follows. Specifically, the technical solutions provided in the embodiments of this application are described in detail with reference to FIG. 1 to FIG. 4.

[0022] Referring to FIG. 1, FIG. 1 is a schematic structural diagram of a light source system according to an embodiment of this application. The light source system includes:

a first light-emitting subsystem, a light source shaping subsystem, and a second light-emitting subsystem located between the first light-emitting subsystem and the light source shaping subsystem, where

the first light-emitting subsystem includes a laser light source array 11, and the laser light source array 11 includes at least one laser light source 111; and

a wavelength conversion apparatus 12 disposed on an output light path of the laser light source array 11, where the wavelength conversion apparatus 12 includes at least one wavelength conversion area 121;

the second light-emitting subsystem includes: a first LED array 21 disposed on an output light path of the wavelength conversion apparatus 12, where a light-emitting surface of the first LED array 21 is facing away from the wavelength conversion apparatus 12, and the first LED array 21 includes a first light transmitting hole 211 that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus 12; and

the light source shaping subsystem includes an integration lens group 31 disposed on an output light path of the first LED array 21;

a first condensing lens 32 disposed on a side of the integration lens group 31 that is facing away from the first LED array 21; and

a moveable optical block 33 disposed on a side of the first condensing lens 32 that is facing away from the integration lens group 31, where the moveable optical block 33 can move into or move out of an output light path of the first condensing lens 32.

[0023] It should be noted that, by using a controller electrically connected to the laser light source array, the light source system provided in this embodiment of this application may further control the laser light source array to be switched on or off and control current intensity of

the laser light source array, to control the first light-emitting subsystem to be switched on or off and adjust light source intensity of the first light-emitting subsystem.

**[0024]** According to the light source system provided in this embodiment of this application, laser light emitted by a laser light source is incident into the wavelength conversion apparatus; the wavelength conversion area of the wavelength conversion apparatus emits exciting light after being excited by the laser light; after passing through the first light transmitting hole, the exciting light is combined with light emitted by the first LED array and then incident into the light source shaping subsystem; combined light is first incident into the integration lens group, and after the integration lens group homogenizes the incident light, the incident light is output to the first condensing lens, and passing through the first condensing lens. When output light with a small light spot needs to be output from the light source system, the moveable optical block may be moved into the output light path of the first condensing lens, and the output light of the first condensing lens may be further converged by the moveable optical block and then output. In this case, not only light can be output with a small light spot, but also a light beam effect can be produced. When output light with a large light spot needs to be output from the light source system, the moveable optical block may be moved out of the output light path of the first condensing lens, and the output light of the first condensing lens may be directly used as the output light of the light source system.

**[0025]** It should be noted that, in this embodiment of this application, for the provided light source system, the laser light source array and the first LED array of the light source system may be lighted up at the same time, or may not be lighted up at the same time. This needs to be designed based on actual application, and is not specifically limited in this embodiment of this application.

**[0026]** In addition, in the light source system in this embodiment of this application, light emission colors of a single laser light source of the laser light source array and a single LED chip of the first LED array are not specifically limited, and specific design needs to be performed based on colors of light that needs to be emitted by the first light-emitting subsystem and light that needs to be emitted by the light source system. The wavelength conversion area is a Phosphor area. In this embodiment of this application, a color of the Phosphor area is not specifically limited. When the first light-emitting subsystem is required to emit white light, the laser light source array may be set to a blue light laser light source array, and a wavelength conversion area of the wavelength conversion apparatus may be set to a yellow Phosphor area; or the laser light source array may be set to ultra-violet laser light source array, and a wavelength conversion area of the wavelength conversion apparatus may be set to a green Phosphor area. When the light source system is required to emit white light, the laser light source array may be used to excite the wavelength conversion apparatus to emit exciting light of any color of

red, green and blue, and the first LED array emits light of the other two colors. Then, the light of the three colors is combined to generate the white light.

**[0027]** The wavelength conversion apparatus in the embodiment shown in FIG. 1 is a wavelength conversion apparatus of a light transmitting type. The wavelength conversion apparatus provided in this embodiment of this application may further be a wavelength conversion apparatus of a reflection type. Specifically referring to FIG. 2, FIG. 2 is a schematic structural diagram of a first light-emitting subsystem according to an embodiment of this application. The first light-emitting subsystem further includes:

a reflector 13 disposed on a light-emitting light path of the laser light source 111, configured to reflect laser light emitted by the laser light source 111; and

a color separation apparatus 14 that is disposed on a reflection light path of the reflector 13 and is located between the wavelength conversion apparatus 12 and the first light transmitting hole 211, configured to: reflect the laser light reflected by the reflector 13 to any wavelength conversion area 121 of the wavelength conversion apparatus 12, and transmit the exciting light that is emitted by the wavelength conversion area 121 after the wavelength conversion area is excited by the laser light to the first light transmitting hole 211,.

**[0028]** In addition, to further improve the light emergence effect, the first light-emitting subsystem provided in this embodiment of this application further includes:

a first collimating lens 15 that is disposed on the light-emitting light path of the laser light source 111 and is located between the laser light source 111 and the reflector 13; and

a second condensing lens 16 disposed between the wavelength conversion apparatus 12 and the color separation apparatus 14.

**[0029]** Specifically, according to the first light-emitting subsystem shown in FIG. 2 in this embodiment of this application, laser light emitted by a laser light source is output to a reflector corresponding to the laser light source. The reflector reflects the output laser light to the color separation apparatus. The color separation apparatus may be a dichroic filter. The color separation apparatus is set to be capable of reflecting laser light of a color emitted by the laser light source, and transmitting exciting light of another color emitted by the wavelength conversion area after the wavelength conversion area is excited by the laser light; and therefore color separation is performed by using the color separation apparatus, to make the exciting light output to the first light transmitting hole.

**[0030]** The first LED array provided in this embodiment of this application may include: a plurality of LED chips; and a second collimating lens disposed on a light-emitting light path of the LED chips. A light emission effect of the LED chip is improved by using the second collimating lens. A circuit board of the first LED array provided in this embodiment of this application may be a copper board or a board of another material. This is not specifically limited in this embodiment of this application.

**[0031]** In addition, to improve a heat dissipation effect of the light source system, referring to FIG. 3, FIG. 3 is a schematic structural diagram of a second light-emitting subsystem according to an embodiment of this application. The second light-emitting subsystem provided in this embodiment of this application further includes: a heat pipe substrate 22 that is disposed on the back of the first LED array 21 and is located between the first LED array 21 and the first light-emitting subsystem, where the first light transmitting hole 211 penetrates the heat pipe substrate 22, and a quantity of heat pipes on the heat pipe substrate is not specifically limited in this embodiment of this application.

**[0032]** In addition, an embodiment of this application further provides another light source system. Specifically referring to FIG. 4, FIG. 4 is a schematic structural diagram of another light source system according to an embodiment of this application. The second light-emitting subsystem of the light source system shown in FIG. 4 in this embodiment of this application further includes:

a second LED array 23 and a third LED array 24 these are respectively disposed on two sides of the first LED array 21 and are disposed perpendicular to the first LED array 21, where light-emitting colors of the first LED array 21, the second LED array 23, and the third LED array 24 are different; and

a light combination apparatus disposed between the second LED array 23 and the third LED array 24.

**[0033]** The light combination apparatus includes:

a first dichroic filter 251 and a second dichroic filter 252 that are disposed in an X shape, where

the first dichroic filter 251 reflects, the light emitted by the second LED array 23 to the integration lens group 31, and the first dichroic filter 251 transmits light emitted by the first LED array 21 and the third LED array 24; the second dichroic filter 252 reflects the light emitted by the third LED array 24 to the integration lens group 31, and the second dichroic filter 252 transmits the light emitted by the first LED array 21 and the second LED array 23.

**[0034]** Specifically, an example in which the light source system needs to emit white light is used. The first LED array, the second LED array, and the third LED array

emit light of different colors, which are respectively any one of red, green, and blue. In addition, the exciting light emitted by the wavelength conversion apparatus after the wavelength conversion apparatus is excited by the laser light source array has a color that is the same as that of the light emitted by the first LED array, thereby preventing the light combination apparatus from filtering the exciting light. Alternatively, the exciting light emitted by the wavelength conversion apparatus after the wavelength conversion apparatus is excited by the laser light source array is white light. Preferably, the first LED array emits green light, the laser light source array emits blue light or ultraviolet or near ultraviolet laser light, and green Phosphor is set on the wavelength conversion apparatus, so that green light emitted from a first light-emitting subsystem can be obtained.

**[0035]** Further, to ensure that exciting light passes through the light combination apparatus without a loss, referring to FIG. 4, the light combination apparatus provides in this embodiment of this application further includes a second light transmitting hole 253 that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus 12.

**[0036]** In addition, referring to FIG. 4, the moveable optical block provided in this embodiment of this application includes:

a lens barrel 331;

at least one third condensing lens 332 disposed inside the lens barrel 331; and

a rotation shaft 333 permanently connected to the lens barrel 331, where the rotation shaft 333 is configured to drive the lens barrel 331 to rotate into or rotate out of the output light path of the first condensing lens 32.

**[0037]** Correspondingly, an embodiment of this application further provides a lighting system, where the lighting system includes the light source system.

**[0038]** The embodiments of this application provide a light source system and a lighting apparatus, including: a first light-emitting subsystem, a light source shaping subsystem, and a second light-emitting subsystem located between the first light-emitting subsystem and the light source shaping subsystem, where the first light-emitting subsystem includes a laser light source array, and the laser light source array includes at least one laser light source; and a wavelength conversion apparatus disposed on an output light path of the laser light source array, where the wavelength conversion apparatus includes at least one wavelength conversion area; the second light-emitting subsystem includes: a first LED array disposed on an output light path of the wavelength conversion apparatus, where a light-emitting surface of the first LED array is facing away from the wavelength conversion apparatus, and the first LED array includes a first

light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus; and the light source shaping subsystem includes an integration lens group disposed on an output light path of the first LED array; a first condensing lens disposed on a side of the integration lens group that is facing away from the first LED array; and a moveable optical block disposed on a side of the first condensing lens that is facing away from the integration lens group, where the moveable optical block can move into or move out of an output light path of the first condensing lens.

**[0039]** It can be learned from the foregoing content that, the technical solutions provided in the embodiments of this application mix an LED array and a laser light source array, to complement light emission of the LED array, increase a luminous flux output, and effectively control a volume and costs of the light source system. In addition, a size of an output light spot of the light source system is switched by moving in or moving out a moveable optical block in the light source system.

**[0040]** The above description of the disclosed embodiments enables persons of ordinary skilled in the art to implement or use the present utility model. Various modifications to these embodiments are obvious to the persons of ordinary skilled in the art, and the general principles defined in the present disclosure may be implemented in other embodiments without departing from the spirit and scope of the present utility model. Therefore, the present utility model is not limited to these embodiments illustrated in the present disclosure, but needs to conform to the broadest scope consistent with the principles and novel features disclosed in this document.

## Claims

1. A light source system, comprising: a first light-emitting subsystem, a light source shaping subsystem, and a second light-emitting subsystem located between the first light-emitting subsystem and the light source shaping subsystem, wherein the first light-emitting subsystem comprises a laser light source array, and the laser light source array comprises at least one laser light source; and a wavelength conversion apparatus disposed on an output light path of the laser light source array, wherein the wavelength conversion apparatus comprises at least one wavelength conversion area; the second light-emitting subsystem comprises: a first light emitting diode (LED) array disposed on an output light path of the wavelength conversion apparatus, wherein a light-emitting surface of the first LED array is facing away from the wavelength conversion apparatus, and the first LED array comprises a first light transmitting hole that allows light to pass through and that coincides with the output light path of the wavelength conversion apparatus; and

the light source shaping subsystem comprises an integration lens group disposed on an output light path of the first LED array; a first condensing lens disposed on a side of the integration lens group that is facing away from the first LED array; and a moveable optical block disposed on a side of the first condensing lens that is facing away from the integration lens group, wherein the moveable optical block moves into or moves out of an output light path of the first condensing lens.

2. The light source system according to claim 1, wherein the first light-emitting subsystem further comprises:

a reflector disposed on a light-emitting light path of the laser light source, configured to reflect laser light emitted by the laser light source; and a color separation apparatus that is disposed on a reflection light path of the reflector and is located between the wavelength conversion apparatus and the first light transmitting hole, configured to: reflect the laser light reflected by the reflector to any wavelength conversion area of the wavelength conversion apparatus, and project the excited light emitted from the wavelength conversion area when being excited by the laser light to the first light transmitting hole,.

3. The light source system according to claim 2, wherein the first light-emitting subsystem further comprises:

a first collimating lens that is disposed on the light-emitting light path of the laser light source and is located between the laser light source and the reflector; and a second condensing lens disposed between the wavelength conversion apparatus and the color separation apparatus.

4. The light source system according to claim 1, wherein the first LED array comprises:

a plurality of LED chips; and a second collimating lens disposed on a light-emitting light path of the LED chips.

5. The light source system according to claim 1, wherein the second light-emitting subsystem further comprises:

a heat pipe substrate that is disposed on the back of the first LED array and is located between the first LED array and the first light-emitting subsystem, wherein the first light transmitting hole penetrates the heat pipe substrate.

6. The light source system according to claim 1, wherein the second light-emitting subsystem further comprises:

a second LED array and a third LED array these 5  
are respectively disposed on two sides of the  
first LED array and are disposed perpendicular  
to the first LED array, wherein light-emitting  
colors of the first LED array, the second LED  
array, and the third LED array are different; and 10  
a light combination apparatus disposed between the second LED array and the third LED array.

7. The light source system according to claim 6, wherein the light combination apparatus comprises: 15

a first dichroic filter and a second dichroic filter  
that are disposed in an X shape, wherein 20  
the first dichroic filter reflects the light emitted  
by the second LED array to the integration lens  
group, and the first dichroic filter transmits light  
emitted by the first LED array and the third LED  
array; the second dichroic filter reflects the light 25  
emitted by the third LED array to the integration  
lens group, and the second dichroic filter transmits  
the light emitted by the first LED array and  
the second LED array.

8. The light source system according to claim 6, wherein the light combination apparatus further comprises 30  
a second light transmitting hole that allows light to  
pass through and that coincides with the output light  
path of the wavelength conversion apparatus.

9. The light source system according to claim 1, wherein the moveable optical block comprises: 35

a lens barrel;  
at least one third condensing lens disposed inside the lens barrel; and 40  
a rotation shaft permanently connected to the  
lens barrel, wherein the rotation shaft is configured to drive the lens barrel to rotate into or rotate  
out of the output light path of the first condensing 45  
lens.

10. A lighting system, wherein the lighting system comprises the light source system according to any one of claims 1 to 9. 50

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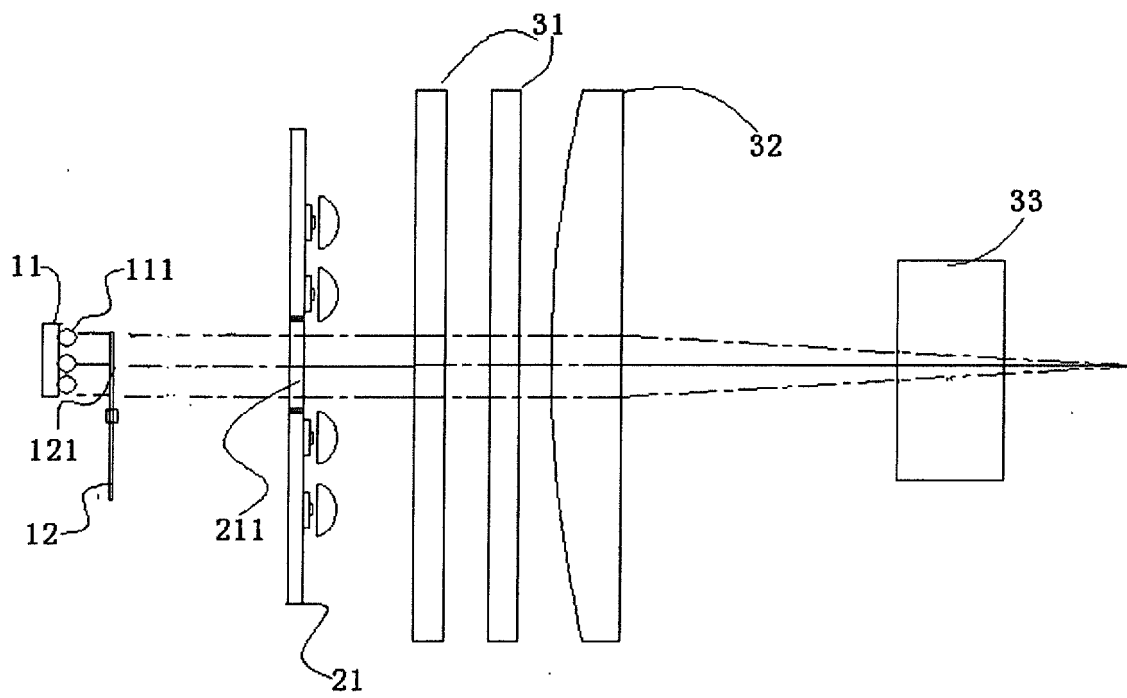


FIG. 1

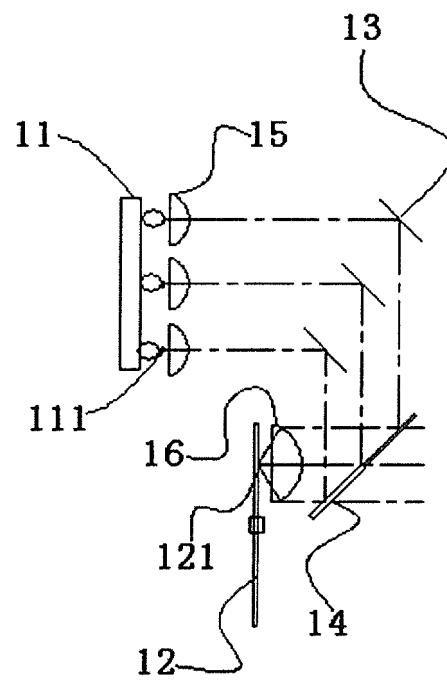


FIG. 2

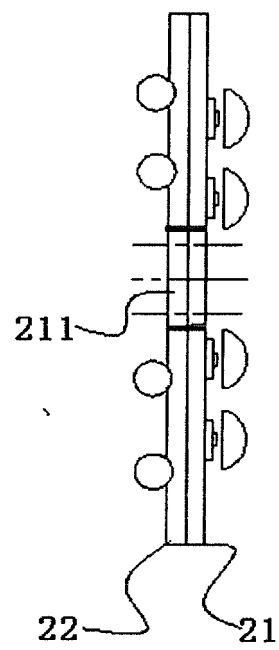


FIG. 3

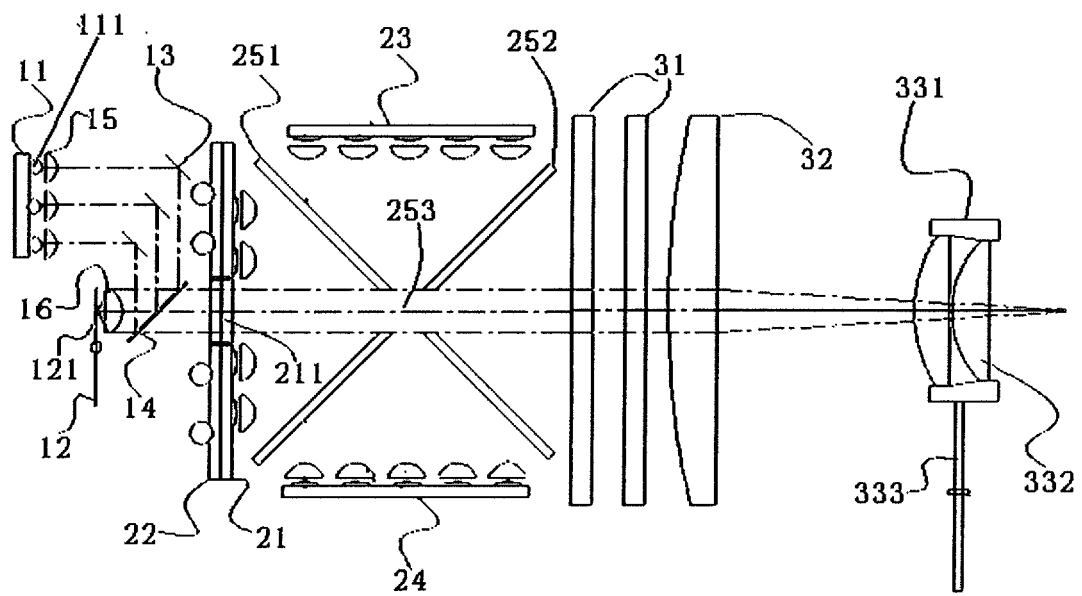


FIG. 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/109806

## A. CLASSIFICATION OF SUBJECT MATTER

F21S 2/00 (2016.01) i; F21V 13/00 (2006.01) i; F21V 14/00 (2006.01) i; F21Y 115/10 (2016.01) n; F21Y 115/30 (2016.01) n  
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)

F21

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, CNTXT, VEN, TWABS: laser diode, light emitting diode, light, condense, move in, move out, roll-in, roll-out, light path, light spot, LD?, LED?, laser, wavelength, colo?r, conver+, chang+, fluorescence, focus+, spot?, mov+, rotat+

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                               | Relevant to claim No. |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| PX        | CN 205350946 U (SHENZHEN YLX TECHNOLOGY DEVELOPMENT CO., LTD.), 29 June 2016 (29.06.2016), claims 1-10                                                                           | 1-10                  |
| X         | CN 102662301 A (APPOTRONICS CORPORATION LTD.), 12 September 2012 (12.09.2012), description, paragraphs [0046]-[0050], [0067]-[0082] and [0089], and figures 2a, 2b, 6a, 6b and 7 | 1-10                  |
| A         | CN 102741742 A (NEC DISPLAY SOLUTIONS, LTD.), 17 October 2012 (17.10.2012), the whole document                                                                                   | 1-10                  |
| A         | CN 105090830 A (GOLDEN SEA PROFESSIONAL EQUIPMENT LIMITED), 25 November 2015 (25.11.2015), the whole document                                                                    | 1-10                  |
| A         | CN 102929087 A (BEIJING UNIVERSITY OF AERONAUTICS AND ASTRONAUTICS), 13 February 2013 (13.02.2013), the whole document                                                           | 1-10                  |
| A         | CN 104280878 A (INSTITUTE OF SEMICONDUCTORS, CHINESE ACADEMY OF SCIENCES), 14 January 2015 (14.01.2015), the whole document                                                      | 1-10                  |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| "P" document published prior to the international filing date but later than the priority date claimed                                                                  | "&" document member of the same patent family                                                                                                                                                                                                    |

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

**PCT/CN2016/109806**

| Patent Documents referred<br>in the Report | Publication Date  | Patent Family    | Publication Date |
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| CN 102662301 A                             | 12 September 2012 | CN 102662301 B   | 27 May 2015      |
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| CN 105090830 A                             | 25 November 2015  | None             |                  |
| CN 102929087 A                             | 13 February 2013  | None             |                  |
| CN 104280878 A                             | 14 January 2015   | None             |                  |

Form PCT/ISA/210 (patent family annex) (July 2009)