



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.10.2024 Bulletin 2024/40

(21) Application number: **24167520.6**

(22) Date of filing: **28.03.2024**

(51) International Patent Classification (IPC):
F21S 8/00 ^(2006.01) **F21V 11/18** ^(2006.01)
F21V 14/08 ^(2006.01) **F21V 17/02** ^(2006.01)
F21Y 115/10 ^(2016.01)

(52) Cooperative Patent Classification (CPC):
F21S 8/00; F21V 11/186; F21V 14/08; F21V 17/02;
F21Y 2115/10

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **30.03.2023 CN 202310358903**

(71) Applicants:
• **Self Electronics Co., Ltd.**
Ningbo City, Zhejiang 315103 (CN)
• **Lin, Wanjiong**
Ningbo City, Zhejiang 315103 (CN)
• **SELF ELECTRONICS Germany GmbH**
51149 Köln (DE)

(72) Inventors:
• **Liu, Xiaoyun**
Ningbo, 315103 (CN)
• **HE, Zuping**
Ningbo, 315103 (CN)
• **WANG, Ke**
Ningbo, 315103 (CN)
• **Xu, Kai**
Ningbo, 315103 (CN)
• **YU, Zhoucun**
Ningbo, 315103 (CN)

(74) Representative: **2K Patentanwälte Blasberg**
Kewitz & Reichel
Partnerschaft mbB
Schumannstrasse 27
60325 Frankfurt am Main (DE)

(54) **LIGHT SPOT ADJUSTMENT MECHANISM**

(57) The invention provides a light spot adjustment mechanism, which includes at least one light cutter arranged between a light source and an illumination surface, which is adjustably arranged in the light emission direction of the light source and is suitable for changing the passing range of the light; and a driving mechanism configured for driving the movement of the light cutter.

On the one hand, the light spot adjustment mechanism of the present invention can improve the accuracy of light spot adjustment and facilitate fine-tuning, so that the formed light spot has better adaptability to the illuminated object. On the other hand, it eliminates the tedious steps of manual operation and greatly improves the convenience of adjustment operations.

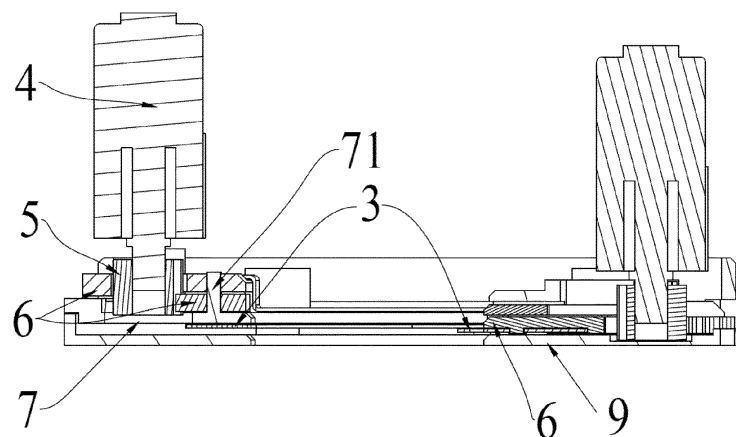


Fig. 1

Description

Technical field

[0001] The present invention relates to the field of lamps, specifically to the technical field of light spot adjustment in lamps, and in particular to a light spot adjustment mechanism.

Background art

[0002] With the improvement of people's living standards, in indoor key lighting situations, people have requirements for the shape of the light spot, in addition to the requirements for light color and performance. In order to highlight the illumination target, lamps are required to be able to emit light of a specific shape, and this is mainly achieved through a spot adjustment mechanism. For example, a spot light is a kind of lamp that people choose to improve the display effect of illuminated art paintings. By shining the light spot on the painting, the viewer can clearly see the details of the painting. In existing lamps for images, the shape and size of the spot is often changed by replacing a filter. In addition, the shape of the spot can also be adjusted freely through an adjustable light cutter.

[0003] There is currently a type of light cutter product on the market, which can change the size and shape of the light spot by freely adjusting four cutter pieces in four directions. For example, the utility model number 201822192654.5 discloses a spot adjustment component of a spot lamp and a spot lamp, which require manual operation and adjustment during use. When such a lamp is installed at a high place, it is necessary to rely on personnel to climb up a ladder and manually change the placement of the light cutter to adjust the light spot. The accuracy is poor and the operation is very inconvenient.

[0004] Therefore, those skilled in the art are committed to developing a light spot adjustment mechanism to improve the user's convenience in adjusting the lamp.

Summary of invention

[0005] In view of the above-mentioned defects of the prior art, the technical problem to be solved by the present invention is the problem of poor accuracy and convenience of the current spot adjustment mechanism.

[0006] In order to achieve the above object, the present invention provides a light spot adjustment mechanism, which includes at least one light cutter arranged between a light source and an illumination surface, which is adjustably arranged in the light emission direction of the light source and is suitable for changing the passing range of the light; and a driving mechanism, configured for driving the movement of the light cutter.

[0007] Further, the illumination surface is arranged in the vertical direction, the spot adjustment mechanism is arranged close to the light source, the light emitting di-

rection of the light source forms an inclination angle with the horizontal direction, and the light cutter is controlled and adjusted to make the light spot formed on the illumination surface match the illuminated object.

[0008] Further, the driving mechanism includes a motor, and the motor is drivingly connected to the light cutter.

[0009] Furthermore, a gear is arranged between the motor and the light cutter to achieve transmission.

[0010] Furthermore, the light cutter includes a rack portion, and the rack portion and the gear are engaged and connected.

[0011] In one embodiment of the present invention, multiple light spot adjustment mechanisms are provided to form multiple light spots, and adjacent light spots are combined to form a total light spot matching the illuminated object.

[0012] Preferably, at least one pair of light cutters is included, and the at least one pair of light cutters relatively reciprocates in one direction under linear drive to block or open the passing range of light.

[0013] Further, the light cutter is provided with a guide groove, the length direction of the guide groove is consistent with the moving direction of the light cutter, a guide block is adapted to the guide groove, and the movement of the light cutter is constrained by the guide block.

[0014] Furthermore, there are multiple light cutters, and the plurality of light cutters surround the passing range of light to form light-cutting holes to limit the passing range of light.

[0015] In a preferred embodiment of the present invention, the light-cutting hole is arranged in an inverted trapezoid shape.

[0016] Further, a base plate is included, and a plurality of light cutters are arranged on the same side or both sides of the base plate.

[0017] Further, the light cutter is coplanar with a light-cutting surface, and the driving mechanism adjusts the angle or distance between the light-cutting surface and the illumination surface.

[0018] Further, the moving mode of the light cutter includes translation, rotation or a combination thereof.

[0019] Further, the light source is an LED light source.

[0020] Since the light spot adjustment mechanism of the present invention is driven by a motor, on the one hand, it can improve the accuracy of light spot adjustment and facilitate fine-tuning, so that the formed light spot has better adaptability to the illuminated object. On the other hand, it eliminates the tedious steps of manual operation and greatly improves the convenience of adjustment operations.

[0021] The concept, specific structure and technical effects of the present invention will be further described below in conjunction with the accompanying drawings to fully understand the purpose, features and effects of the present invention.

Brief description of the drawings

[0022]

Figure 1 is a schematic structural diagram of a longitudinal section of the light spot adjustment mechanism of the present invention;

Figure 2 is a schematic diagram of a usage scenario of the light spot adjustment mechanism of the present invention;

Figure 3 is a schematic structural diagram of an embodiment of the light spot adjustment mechanism of the present invention;

Figure 4 is a schematic structural diagram of another embodiment of the light spot adjustment mechanism of the present invention;

Figure 5 is a schematic diagram of the internal structure of position A of the light spot adjustment mechanism in Figure 4;

Figure 6 is a schematic diagram of the internal structure of position B of the light spot adjustment mechanism in Figure 4;

Figure 7 is a schematic diagram of another specific usage scenario of the light spot adjustment mechanism of the present invention.

[0023] Herein: 1 light source, 11 light spots, 2 illumination surface, 21 illuminated object, 3 light cutter, 3a first light cutter, 3b second light cutter, 3c third light cutter, 3d fourth light cutter, 31 light-cutting hole, 4 motor, 41 first motor, 42 second motor, 5 gear, 51 first gear, 52 second gear, 6 rack part, 6a first rack part, 6b second rack part, 6c third rack part, 6d fourth rack part, 7 base plate, 71 guide block, 8 guide groove, 9 cover plate, X first adjustment direction, Y second adjustment direction.

Description of embodiments

[0024] As shown in Figure 1, the light spot adjustment mechanism provided by the present invention includes: at least one light cutter 3 arranged between the light source 1 and the illumination surface 2, which is adjustably arranged in the light emission direction of the light source 1 and is suitable for changing The light passing range also includes a driving mechanism for driving the movement of the light cutter 3.

[0025] As shown in Figure 2, for example, a lighting application such as a lighting lamp is used to illustrate. The illumination object 21, such as a painting, is installed vertically along the wall. The lamp is installed on the ceiling. The light source 1 projects light downward to the front side. The light spot adjustment mechanism is set

close to the light source 1 (not shown in the figure), an enlarged light spot 11 is formed on the illumination surface 2. The light cutter 3 is adjusted to make the light spot 11 formed on the illumination surface 2 match the illumination object 21, and accurately illuminate the illumination object 21. Preferably, the light source 1 is an LED light source.

[0026] The driving mechanism includes a motor 4. A gear 5 is provided between the motor 4 and the light cutter 3 to achieve transmission. The motor 4 is connected to an external drive control circuit to control the switching, forward and reverse rotation of the motor. Motor control is a conventional technical means in this field and will not be repeated here. In a specific implementation, the light cutter 3 includes a rack portion 6, and the rack portion 6 meshes with the gear 5; when the motor 4 drives the gear 5 to rotate, the gear 5 drives the rack portion 6 to move, and the rack portion 6 is engaged with the gear 5. The position of the light cutter 3 is changed.

[0027] In a specific embodiment of the present invention, as shown in Figure 3, multiple light cutters 3 are provided, and the plurality of light cutters 3 are form a light-cutting hole 31 by surrounding and limiting the light passage range and form a light spot 11 of a specific shape and size.

[0028] Preferably, two gears 5 for driving are provided to control two adjustment directions respectively. Both sides of each gear 5 are transmission-connected to a rack portion 6, so that when the gear 5 rotates, the two light cutters 3 can be driven at the same time and move relatively to change the light passing range in a blocking or opening manner. Each pair of the two pairs of light cutters 3 moves relatively along an adjustment direction. The two pairs of light cutters 3 are combined to form a light-cutting hole 31. The gear 5 drives the light cutter 3 to translate, thereby changing the size of the light-cutting hole 31, so that the light spot 11 formed by the illumination can be expanded or reduced accordingly.

[0029] For the above structure, the light cutters 3 on both sides move synchronously at the same distance as the gear 5 rotates. Two pairs of light cutters 3 can be further provided with overlapping motion centers, and each pair of light cutters 3 is symmetrically moved relative to the motion center. When adjusting the projected light spot 11, the center of the light spot 11 is aligned with the center of the illuminated object 21 along the light illumination direction, so that the light spot adjustment can be completed symmetrically and quickly.

[0030] Due to the use of a motor drive, compared with the traditional method of manually adjusting the light cutter, on the one hand, the accuracy of spot adjustment is improved, fine-tuning is facilitated, and there is better adaptability to the illuminated object; on the other hand, the cumbersome manual operation is eliminated. In this operation, wireless control of motor operation can be used to achieve remote adjustment.

[0031] The gear 5 is used to drive and move the light cutter 3. One gear 5 can be used to drive two light cutters

3 at the same time as mentioned above, or one gear 5 can be used to drive a single light cutter 3, so that each can be adjusted individually. The movement of the light cutter 3 causes more changes in the projected light spot. In addition to using the gear 5 drive method, other linear drive methods can also be selected, such as using a screw rod, a belt drive, etc. to convert the rotation of the motor 4 into a linear movement of the light cutter 3.

[0032] The light cutter 3 can also adjust the light spot by being driven to rotate. For example, the gear 5 or other connecting component may be drivingly connected to the light cutter 3 so that each light cutter 3 can rotate along its own axis, and the shape and size of the light-cutting hole 31 changes as each light cutter 3 rotates.

[0033] Figure 3 shows a specific embodiment of the light spot adjustment mechanism of the present invention. It includes two motors 4 and four light cutters 3, and each motor 4 drives two light cutters 3 at the same time to adjust their positions.

[0034] In another embodiment of the present invention, the light spot adjustment mechanism contains a base plate 7, which is mainly used for the installation and positioning of other components. As shown in Figures 4 to 6, a first motor 41 and a second motor 42 are installed on the base plate 7. The output end of the first motor 41 is connected to the first gear 51 to control and adjust the first light cutter 3a and the second light cutter 3b. The first light cutter 3a includes a first rack part 6a, the second light cutter 3b includes a second rack part 6b, the first rack part 6a and the second rack part 6b are engaged with the first gear 51. The two sides of the gear are connected by transmission, and the direction of the racks on both sides is parallel to the first adjustment direction X. Similarly, the second motor 42 on the base plate 7 is drivingly connected to the third light cutter 3c and the fourth light cutter 3d through the second gear 52. The third light cutter 3c includes a third rack portion 6c, the fourth light cutter 3d includes a fourth rack portion 6d, and the third rack portion 6c and the fourth rack portion 6d are respectively engaged on both sides of the second gear 52, and the direction of the rack is parallel to the second adjustment direction Y. The rack portion 6 of the light cutter 3 can be a detachable structure, or can be integrally formed.

[0035] Preferably, the light cutter 3 is provided with a guide groove 8, the length direction of the guide groove 8 is along the adjustment direction of the light cutter 3, and the guide groove 8 is equipped with a guide block 71, and the guide groove 8 moves along the light cutter 3. It is constrained by the guide block 71 to move directionally and the range of movement is also limited. The guide block 71 can be fixedly arranged outside the light cutter 3, for example, formed on the base plate 7, so that the guide groove 8 can move directionally relative to the base plate 7; the guide block 71 can also be arranged on one of the partially overlapping light cutters 3. The light cutters 3 can move relative to each other in a directional manner.

[0036] In order to better utilize the space, two pairs of light cutters 3 are respectively arranged on two surfaces of the base plate 7 according to the first adjustment direction X and the second adjustment direction Y. The first gear 51 and the second gear 52 are arranged along the edges of the base plate 7, and radially set on both sides. Optionally, a cover plate 9 is fixedly installed outside the bottom surface of the base plate 7. The cover plate 9 cooperates with the base plate 7 to accommodate the light cutter 3 on one side of the bottom surface. The motor 4 can also be fixedly installed on the cover plate 9 or the base plate 7. In addition, each light cutter 3 can also be arranged on the same side of the base plate 7 as shown in Figure 3.

[0037] When the lamp is installed on the ceiling, the light emitting direction of the light source 1 is tilted downward and forward, and the lower side of the light beam from the lamp has a longer optical path than the upper side. Since the spot adjustment mechanism is set close to the light source 1, in the light spot 11 formed on the illumination surface 2, the shape of the light-cutting hole 31 is not proportionally enlarged, but is stretched and enlarged on the lower side of the light spot 11. The outer contour of the illuminated object, such as a painting, is mostly square. In order to match the light spot 11 on the illumination surface 2 with the painting, the shape of the light-cutting hole 31 formed by the light cutter 3 is preferably an inverted trapezoid.

[0038] The above-mentioned light spot is formed by the light cutter surrounding the light-cutting hole 31. In addition, when a base plate 7 is provided, a window of a specific size can be opened in the base plate 7 to cooperate with the movement of the light cutter 3 to jointly restrict the passage of light. This can also adjust the light spot formed. Or alternatively, the base plate 7 or the cover plate 9 do not have openings, and can be configured as optical components such as light-transmitting plates or lenses to further distribute light and achieve the effects of light interception and light distribution at the same time.

[0039] Due to different illumination requirements, the light-cutting hole 31 can also be trapezoidal, rectangular, circular or elliptical, etc., so that the light spots formed on the projection surface have different shapes.

[0040] The invention also provides a lamp, which includes the above-mentioned light spot adjustment mechanism. The light spot adjustment mechanism is installed in the lamp housing and in the light emitting direction of the light source 1. According to the aforementioned structure, each light cutter 3 is coplanar to a light plane, and a driving motor in the lamp can be installed to make the light spot adjustment mechanism rotate at a small angle or move back and forth relative to the illumination surface. For example, a rotating component or a telescopic component can be used to connect the components. The base plate may change its position, or a rotating component can be used to rotate the entire lamp at a small angle to change the inclination of the light-cutting surface. The above movement can be achieved by using technical

means commonly used in this field. The angle or distance between the light-cutting surface and the illumination surface changes. Finally, preliminary adjustments to the shape and size of the light spot can be made, and then the light spot may be adjusted through the light cutter.

[0041] When the outline of the irradiation object 21 is too large, even though a single light spot adjustment mechanism can provide an enlarged light spot 11, it may still not match the outline. In this case, several of the above-mentioned mechanisms can be used to cooperate together. As shown in Figure 7, the above-mentioned light spot adjustment mechanisms can be provided in multiple numbers, arranged adjacently in one direction to form multiple light spots 11, and the adjacent light spots 11 are combined to form a total light spot that matches the illuminated object 21. For example, multiple lamps are installed side by side, in which each light spot adjustment mechanism provides a light spot 11, and adjacent light spots 11 are joined at the edges without dark areas, so that the light spots 11 are connected to accommodate illuminated objects 21 with a larger length.

[0042] The preferred embodiments of the present invention are described in detail above. It should be understood that those skilled in the art can make many modifications and changes based on the concept of the present invention without creative efforts. Therefore, any technical solutions that can be obtained by those skilled in the art through logical analysis, reasoning or limited experiments based on the concept of the present invention and on the basis of the existing technology should be within the scope of protection determined by the claims.

Claims

1. A light spot adjustment mechanism, **characterized in that** it includes:

at least one light cutter (3) arranged between a light source (1) and an illumination surface (2), which is adjustably arranged in the light emission direction of the light source (1) and is suitable for changing the passing range of the light; and
a driving mechanism, configured to drive the movement of the light cutter (3).

2. The light spot adjustment mechanism according to claim 1, **characterized in that** the illumination surface (2) is arranged in the vertical direction, the light spot adjustment mechanism is arranged close to the light source (1), the light emission direction of the light source (1) an inclination angle with the horizontal direction, the light cutter (3) is controlled and adjusted to make the light spot (11) formed on the illumination surface (2) match the illuminated object (21).

3. The light spot adjustment mechanism according to claim 1, **characterized in that** the driving mechanism includes a motor (4), and the motor (4) is drivingly connected to the light cutter (3).

4. The light spot adjustment mechanism according to claim 3, **characterized in that** a gear (5) is arranged between the motor (4) and the light cutter (3) to achieve transmission.

5. The light spot adjustment mechanism according to claim 4, **characterized in that** the light cutter (3) includes a rack portion (6), and the rack portion (6) and the gear (5) are engaged and connected.

6. The light spot adjustment mechanism according to claim 2, **characterized in that** there are multiple light spot adjustment mechanisms to form multiple light spots (11), and adjacent light spots (11) are combined to form a total light spot matching the illuminated object (21).

7. The light spot adjustment mechanism according to claim 1, **characterized in that** it includes at least one pair of light cutters (3), and the at least one pair of light cutters (3) relatively reciprocates in one direction under linear drive to block or open the passing range of light.

8. The light spot adjustment mechanism according to claim 1, **characterized in that** the light cutter (3) is provided with a guide groove (8), the length direction of the guide groove (8) is consistent with the movement of the light cutter (3), a guide block (71) is adapted to the guide groove (8), and the movement of the light cutter (3) is constrained by the guide block (71).

9. The light spot adjustment mechanism according to claim 1, **characterized in that** there are multiple light cutters (3), and the plurality of light cutters (3) surround the passing range of light to form light-cutting holes (31) to limit the passing range of light.

10. The light spot adjustment mechanism according to claim 9, **characterized in that** the light-cutting hole (31) is arranged in an inverted trapezoid shape.

11. The light spot adjustment mechanism according to claim 9, **characterized in that** it includes a base plate (7), and a plurality of light cutters (3) are arranged on the same side or both sides of the base plate (7).

12. The light spot adjustment mechanism according to claim 1, **characterized in that** the light cutter (3) is coplanar with a light-cutting surface, and the driving mechanism adjusts the angle or distance between the light-cutting surface and the illumination surface

(2).

13. The light spot adjustment mechanism according to claim 1, **characterized in that** the moving mode of the light cutter (3) includes translation, rotation or a combination thereof. 5

14. The light spot adjustment mechanism according to claim 1, wherein the light source (1) is an LED light source. 10

15

20

25

30

35

40

45

50

55

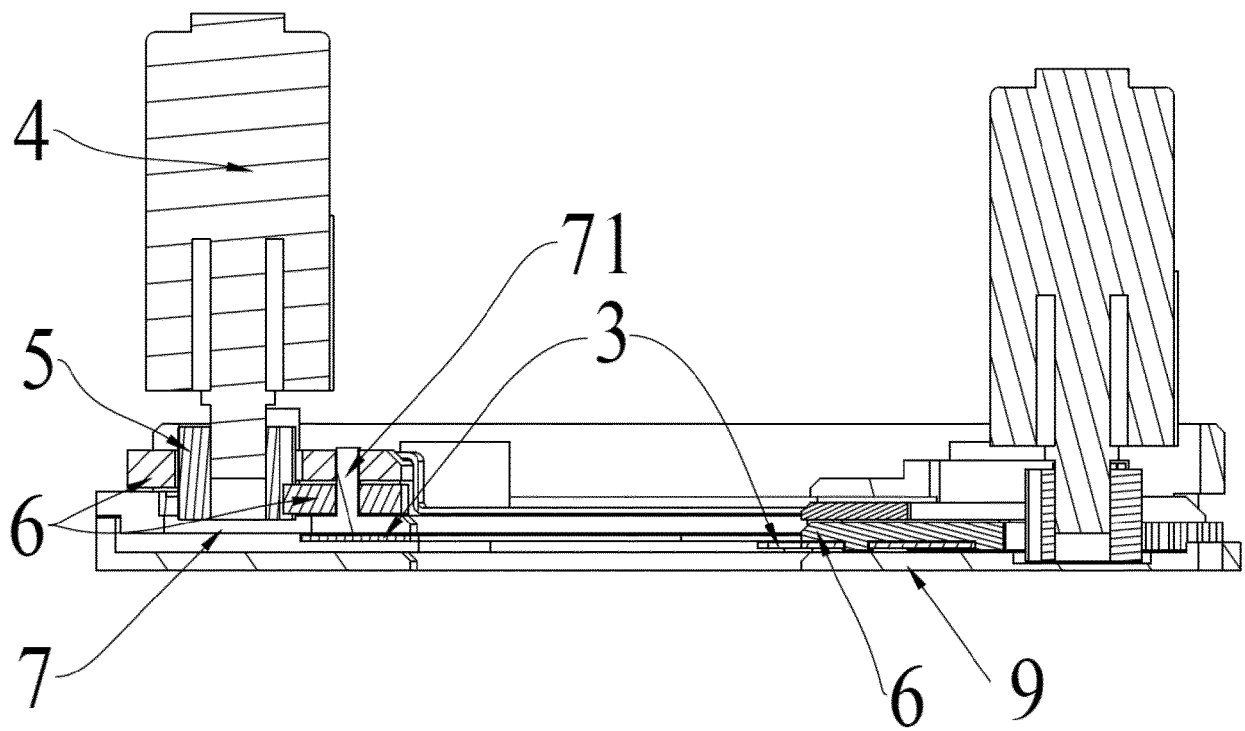


Fig. 1

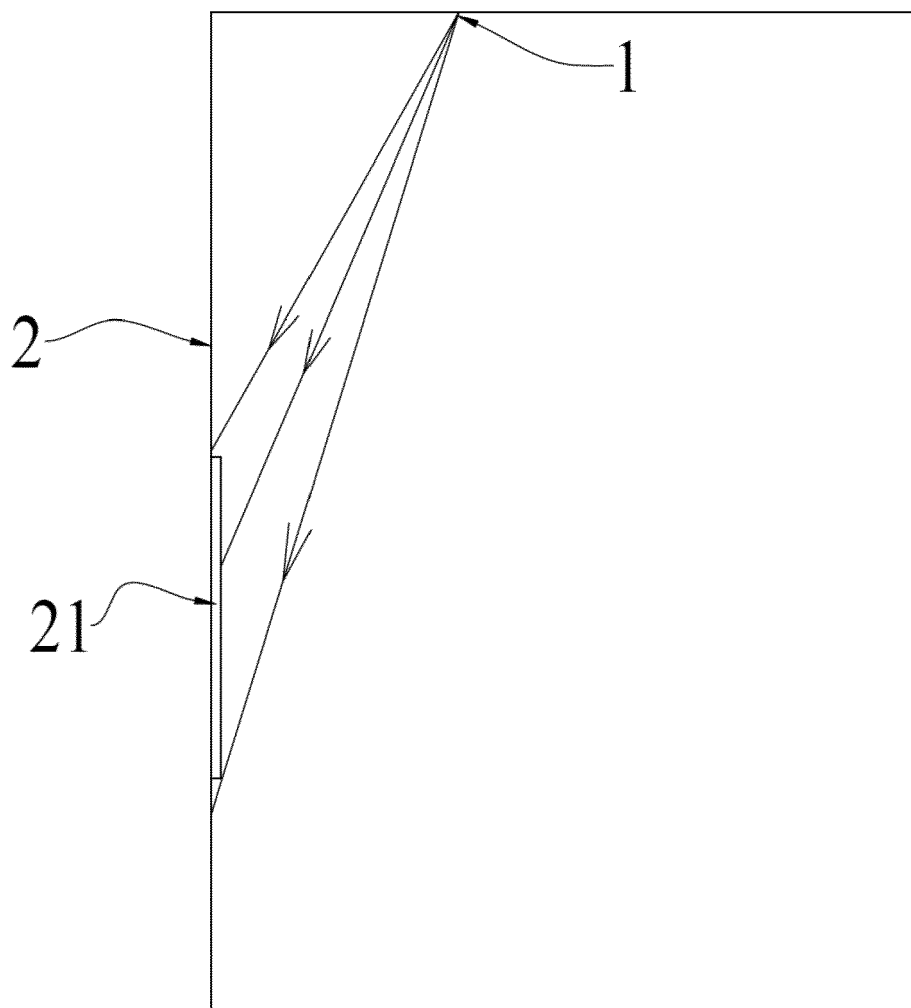


Fig. 2

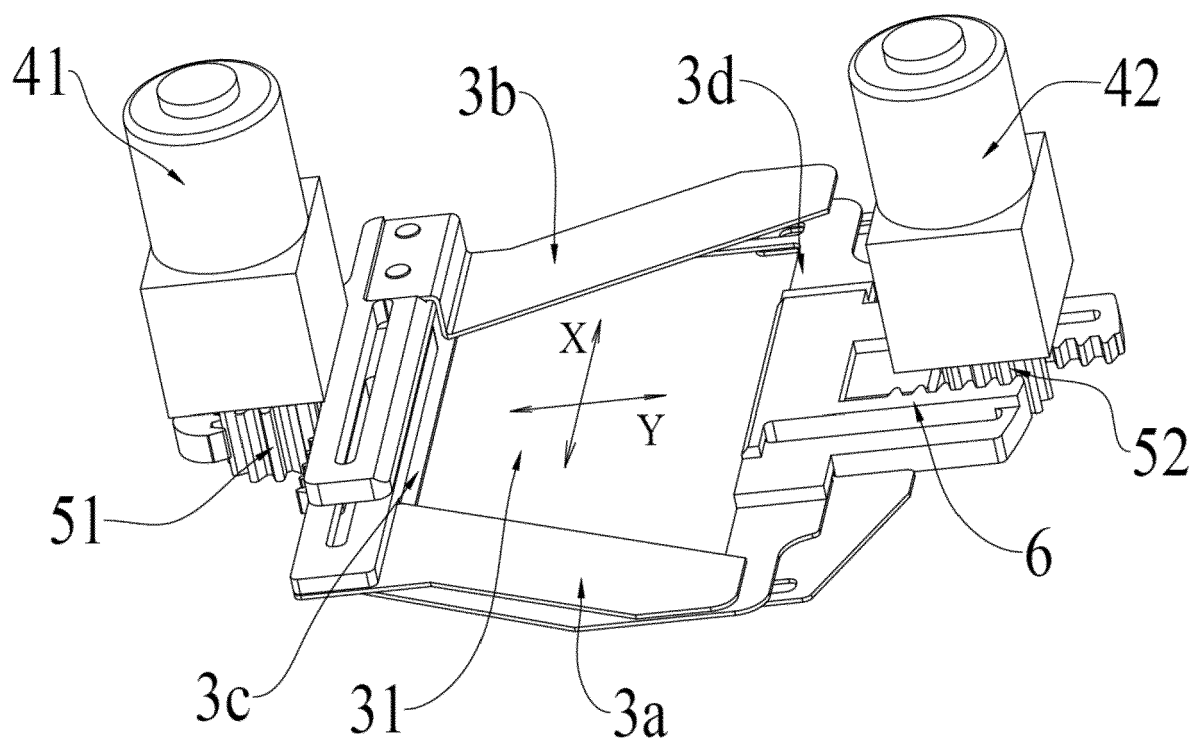


Fig. 3

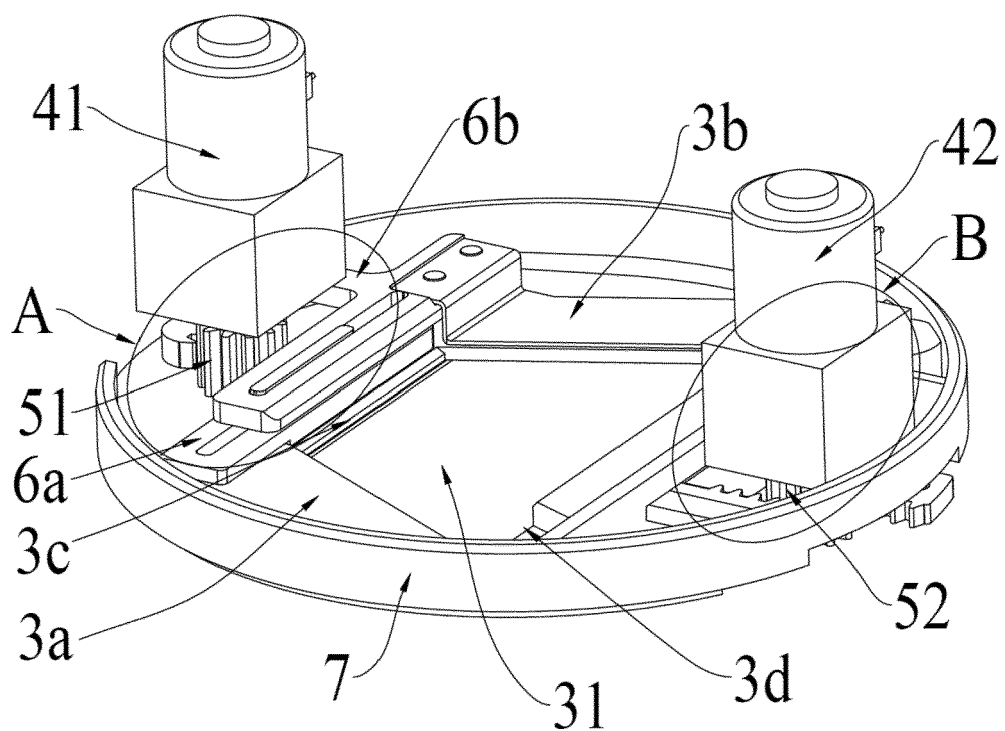


Fig. 4

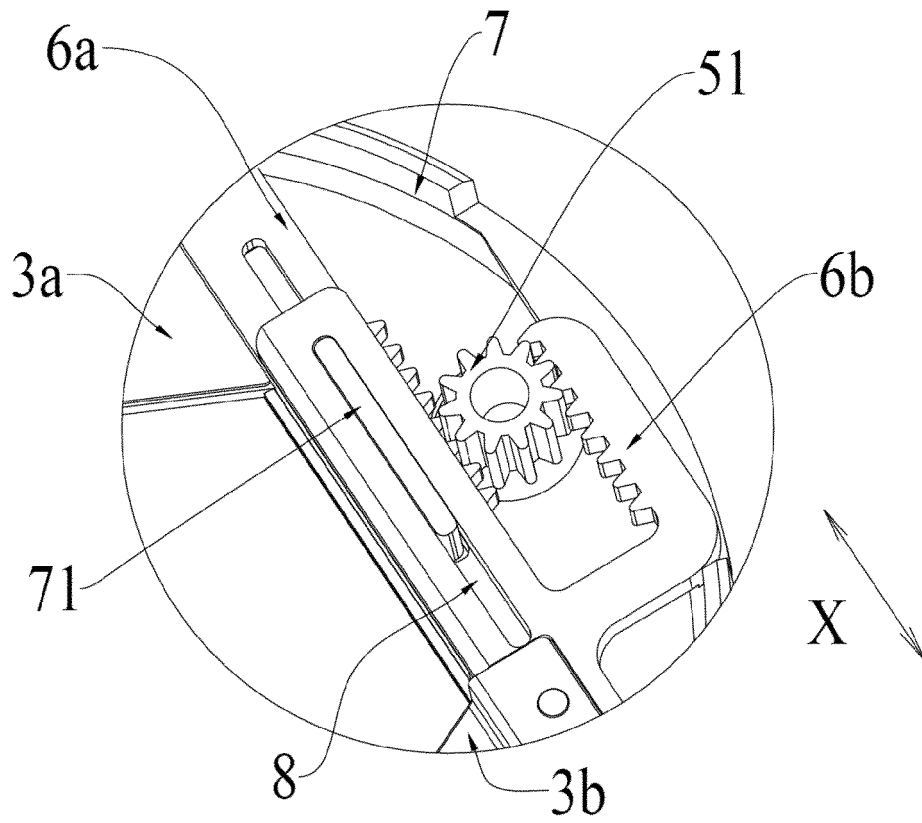


Fig. 5

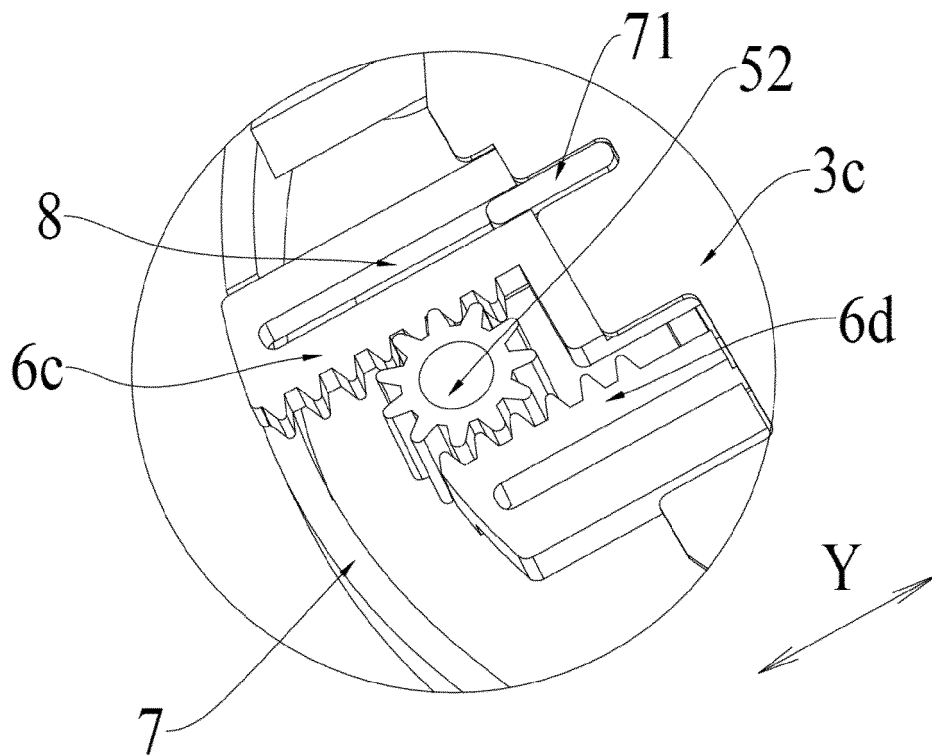


Fig. 6

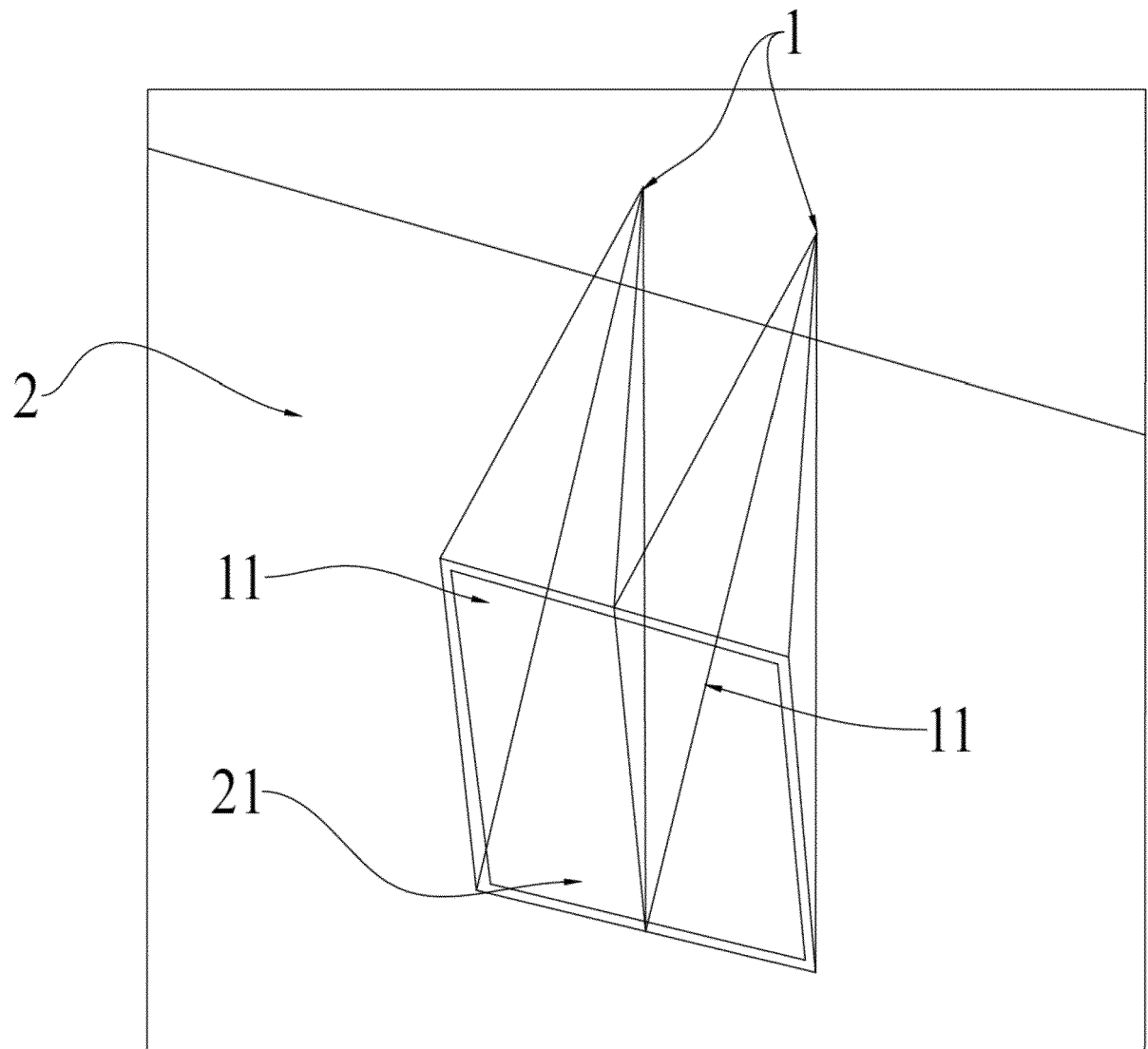


Fig. 7



EUROPEAN SEARCH REPORT

Application Number

EP 24 16 7520

5

10

15

20

25

30

35

40

45

50

55

1

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP H07 320501 A (MATSUSHITA ELECTRIC WORKS LTD) 8 December 1995 (1995-12-08)	1-7,9,11-14	INV. F21S8/00
Y	* the whole document *	3-5,8,12	F21V11/18 F21V14/08 F21V17/02
X	US 2004/017685 A1 (DEDORO BRUNO [IT]) 29 January 2004 (2004-01-29)	1-7,9-14	
Y	* the whole document *	3-5,8,12	ADD. F21Y115/10
X	US 2022/049839 A1 (JIANG WEIKAI [CN]) 17 February 2022 (2022-02-17)	1-11,13,14	
Y	* the whole document *	3-5,8,12	
X	US 2014/085900 A1 (JOHNSON GLENN MERLIN [US]) 27 March 2014 (2014-03-27)	1,2,6,7,9-11,13,14	
Y	* figures 1-6B * * paragraphs [0009], [0047] * * paragraph [0039] * * paragraph [0011] *	3-5,8,12	
			TECHNICAL FIELDS SEARCHED (IPC)
			F21S F21V F21Y
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 May 2024	Examiner Thibaut, Arthur
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 24 16 7520

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-05-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP H07320501 A	08-12-1995	NONE	
US 2004017685 A1	29-01-2004	AT E467081 T1 DK 1384941 T3 EP 1384941 A2 IT MI20021625 A1 US 2004017685 A1	15-05-2010 30-08-2010 28-01-2004 23-01-2004 29-01-2004
US 2022049839 A1	17-02-2022	CN 111853684 A EP 4191126 A1 US 2022049839 A1 WO 2022021825 A1	30-10-2020 07-06-2023 17-02-2022 03-02-2022
US 2014085900 A1	27-03-2014	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 201822192654 A [0003]