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(71) Applicant *(for all designated States except US)*: **MARTIN PROFESSIONAL A/S** [DK/DK]; Olof Palmes Allé 18, DK-8200 Aarhus N (DK).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **VON PREYSS, Thomas, Aleksander, Henrik** [DK/DK]; Birkebakken 16, DK-8520 Lystrup (DK).

(74) Agent: **PATRADE A/S**; Fredens Torv 3A, DK-8000 Århus C (DK).

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(54) **Title:** DRIVE FOR LIGHT FORMING MEANS

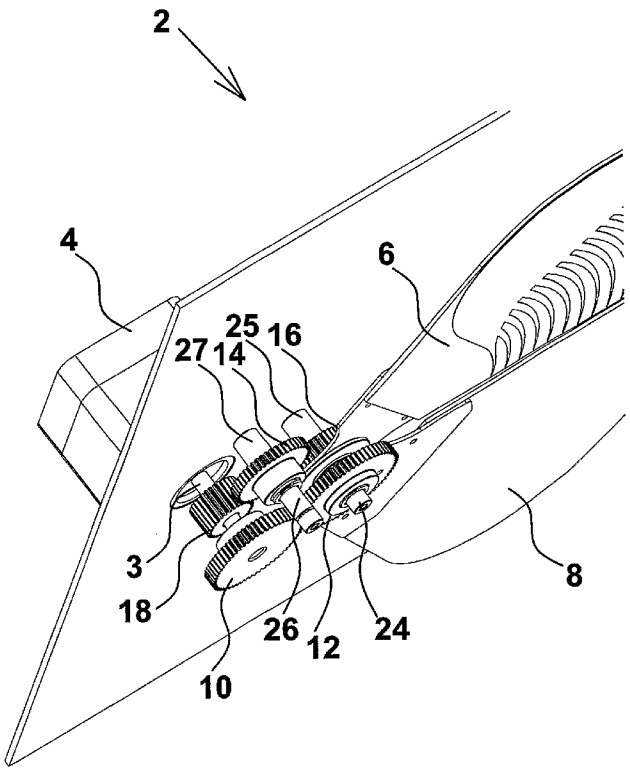


Fig. 4

(57) **Abstract:** The present invention relates to a drive (2), primarily for optical light forming means (6,8), which light forming means can be used in a projector, which projector comprises light generating means, which light generating means forms a light path (30) passing through light forming means, which drive comprises at least one motor (4), which motor can be mechanical connected to at least one optical light forming means (6,8), which light forming means comprises at least partly open area for light, where at least two light forming mean are cooperating in a light path for forming the light, which light forming means are rotated around a common axis (24) in and out of the light path. It is the object of the invention to achieve opposite synchronous movement of light forming means.

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Drive for light forming means

Field of the Invention

The present invention relates to a drive, primarily for optical light forming means, which light forming means can be used in a projector, which projector comprises light generating means, which light generating means form a light path passing through light forming means, which drive comprises at least one motor, which motor can be mechanical connected to at least one optical light forming means, which light forming means comprises at least partly open area for light, where at least two light forming mean are cooperating in a light path for forming the light, which light forming means are rotated around a common axis in and out of the light path.

Background of the Invention

US 6687063 concerns units for projection of profiled images and for floodlighting suffer from a trade off between the quality of the illuminated field and efficiency. The hue, saturation, and intensity must be continuously controllable, and the quality of the illuminated field must be even. According to the invention the optical components have been refined according to a general principle which enables the use of efficient elliptical reflectors without a reduction in quality for both purposes. Each color is controlled by relatively moveable filters having a comb like structure in which the design of the individual teeth compensates for the interaction of the many variables. The intensity is controlled by mechanical dimmers which are designed according to the same principles. This construction will also improve the quality of condenser type projection systems.

US 6402344 concerns a linear effect device for independently and simultaneously rotating two effect discs with in a single axis for use in a conventional illumination system. The rotation of the second effects disc modifies the continuous images generated by the rotation of the first effect disc.

US 6402344 operate by means of two independent motors. These motors are mechanically coupled to each color forming object which objects can be moved completely

independent of each other. The system is used for letting the color forming means rotate about the axis in a continuous rotation. By this invention, it is possible to let the two light forming objects rotate in the same or in different directions simply by controlling the motors. Synchronizing the two motors for operating opposite to each other will be very difficult for all known motor types. Typical small DC or AC motors will not operate with exactly the same speed. Typically in projectors, step motors controlled by computer means are used. There is one problem regarding the step motors in that they might lose one ore more steps in relation to the controlling computers. This happens often during normal operation and a reset of a zero position for the motor is to be performed in order to ensure the correct position. If step motors must operate synchronously, this can only be achieved by placing special measuring and feed back circuits at the rotating axis for a continuous measuring of the actual position and compensate for failures by adjusting the motor position.

US 941752 describes an attachment for a projection apparatus, which attachment concerns external shutters placed in front of a projector. The shutter blades are rotating around a common axis. The shutters are provided with arms, by means of which they are moved upon their pivots, and said arms are connected to an operating rod by means of links, which links form a pair for each shutter.

Object of the Invention

It is the object of the invention to achieve opposite synchronous movement of light forming means.

Description of the Invention

The object can be achieved by a drive as described in the preamble to claim one if the light forming means are rotated equal in opposite direction around the common axis, which light forming means are rotated by a common motor.

Hereby can be achieved that the two light forming means are rotated synchronously, but opposite in relation to each other. If step motors are used, no problem occurs if the step motors just drops one or two steps simply because the light forming means are

rotated from the same driving axis of the motor. The opposite synchronous movement is very important if the light forming means are part of a modern computer controlled projector.

The rotating movement for one of the light forming means can be converted by a gear mechanism, which gear mechanism is connected to the motor. By using an optimal gear mechanism, it is possible to convert the rotating from the axis of a motor into an opposite rotation by use of the gear means, where this rotation can be converted into rotation about the same common axis.

The light forming means can be color flags, which color flags are operating par wise, which color flags are moved into and out from the light path from different directions, which color flags are partly over lapping, which first color flag comprises a first color pattern, which second color flag comprises a second pattern, which first and second pattern are formed opposite each other. Hereby, can be achieved that color mixing system can be achieved in a very simple manner where the rotation about the common axis of the color flags are the only possible ways of compensation for geometric failures in the color pattern at the color flags. By this invention, it is possible to generate a pattern which is exactly opposite to the other flag and this is one of the simplest but most effective ways to achieve a complete correct pattern for color mixing.

In an alternative embodiment for the invention can the light forming means be color flags, which color flags are operating par wise, which color flags are moved into and out from the light path from different directions, which color flags are partly over lapping, which first color flag comprises a first color pattern, which second color flag comprises a second pattern, which first and second patterns has a common centre of rotation, which patterns are formed with mostly equal radial distance to the rotational centre, which pattern are designed with linear increasing filtering characteristic. Herby is it possible to form the flags partly or full overlapping.

The light forming means can instead be dimmer means, which dimmer means comprises a first dimmer flag and a second dimmer flag, which dimmer flags are moved into and out from the light path from different directions, which first dimmer flag

comprises a first pattern, which second dimmer flag comprises a second pattern, which first and second dimmer pattern are formed opposite each other. The opposite rotation around a common axis is also important for dimmers in intelligent projectors.

The light forming means can be effect wheels, which effect wheels can be moved in opposite direction. Also alternatively, effect wheels used in projectors can be operated by rotating means rotating around a common axis.

Description of the Drawing

Preferred embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawing, wherein:

Fig. 1 shows a front of a first embodiment of the invention comprising a light gate;
Fig. 2 shows a partial separated view of the embodiment shown in Fig. 1;
Fig. 3 shows a section view of the embodiment shown in Fig. 1-2;
Fig. 4 shows a close up view of an embodiment of the invention and
Fig. 5 shows an embodiment comprising a light gate.

Detailed Description of the Invention

Fig. 1 illustrates a first device 2 according to the present invention. The device 2 comprises a motor 4 with a motor axle 3 to which a first toothed motor axle gear wheel 10 is attached. The first toothed motor axle gear wheel 10 makes full engagement with a first mating toothed object axle gear wheel 12 attached to an object axle (24 shown in Fig. 4 and 6) provided in parallel to the motor axle 3. The embodiment 2 also comprises a first flag 6 and a second flag 8 adapted to rotate in opposite directions ω_1 and ω_2 abut the axis of the object axle. The device 2 furthermore comprises a toothed support axis gear wheel 14 attached to a support axle (27 shown in Fig. 6) being parallel to the motor axle 3 and the object axle. A light gate 30 providing a light path 32 is arranged within the field of action of the device 2 In use activation of the motor 4 result in a rotation of the first toothed motor axle gear wheel 10, which through the engagement with the first mating toothed object axle gear wheel 12 rotates the second flag 8. In the same time the rotation of the first toothed motor axle gear wheel 10 re-

sults in a rotation of the toothed support axis gear wheel 14. This causes a rotation of the first flag 6 in an opposite direction than the second 8 towards the center line 20 of the device 2. Hence the magnitude of ω_1 and ω_2 are the same; however ω_1 and ω_2 have opposite direction.

Fig. 2 illustrates a partial separated view of the device 2 shown in Fig. 1. The device 2 comprises a motor 4 and five toothed gear wheel 10, 12, 14, 16, 18 and two flags 6, 8. At the left side of the figure a second toothed motor axle gear wheel 18 is attached to the motor axle 3. The second toothed motor axle gear wheel 18 makes full engagement with the mating toothed support axis gear wheel 14 that makes full engagement with the second mating toothed object axle gear wheel 16. The first toothed motor axle gear wheel 10, which is attached to the motor axle 3, makes full engagement with the first mating toothed object axle gear wheel 12.

In use a clock-wise rotation of the motor axle 3 causes a counter-clock-wise rotation of the support axis gear wheel 14, which results in a clock-wise rotation of the first flag 6. The clock-wise rotation of the motor axle 3 will furthermore cause a counter-clock-wise rotation of the first mating toothed object axle gear wheel 12 and hence cause a counter-clock-wise rotation of the second flag.

Fig. 3 shows a section view of the device 2 shown in Fig. 1-2. The device 2 is provided with a motor 4 with a motor axle 3 through which force can be transmitted to cause motion of the first flag 6 and the second flag 8.

Fig. 4 illustrates a close up view of the gear member of a device 2 according to the present invention. The device 2 comprises a motor 4 with a motor axle 3, to which a first toothed motor axle gear wheel 10 and second toothed motor axle gear wheel 18 are attached. The device also comprises a cylindrical support axle 26, 27 with a thin distal part 26 and a thick proximal part 27, to which a toothed support axis gear wheel 14 is fixed. The device furthermore comprises an object axle 24, 25 with a thick proximal part 25 and a thinner distal part 24 adapted to be rotated about the center axis of the thick proximal part 25 so that the thick proximal part 25 and the thin distal part 24 can be rotated in opposite direction at the same time. A first toothed object axle gear

wheel 12 is attached to the distal part of the object axle 24, while a second toothed object axle gear wheel 16 is attached to the thin distal part 24 of the object axle. The device 2 moreover comprises a first flag 6 and a second flag 8 attached to the second toothed object axle gear wheel 16 and first toothed object axle gear wheel 12 respectively.

Fig. 5 illustrates an embodiment of a device 2 according to the present invention, where a light gate 30 providing a light path 32 is arranged within the field of action of the device 2. The device comprises a comprises a first toothed motor axle gear wheel 10 that makes full engagement with a first mating toothed object axle gear wheel 12 attached to an object axle 24. A second flag is attached to the second toothed object axle gear wheel 12. The device 2 also comprises a toothed support axis gear wheel 14, to which a first flag 6 is attached. The first flag 6 is partly covered by the second flag 8.

The invention is not limited to the described embodiments but can be modified in many ways. This applies in particular to the shape, size and material of the motor, axles, gear wheel and flags.

CLAIMS

1. Drive (2) for optical light forming means (6,8), which light forming means (6,8)are used in a projector, which projector comprises light generating means which light generating means form a light path (30) passing through light forming means (6,8), which drive comprise at least one motor (4), which motor (4) is mechanical connected to at least one optical light forming means (6,8), which light forming means (6,8) comprises at least partly open area for light, where at least two light forming mean (6,8) are co-operating in a light path (30) for forming the light, which light forming means (6,8) are rotated around a common axis (24) in and out of the light path (30), **characterized in** that the light forming means (6,8) are rotated by a gear mechanism, which gear mechanism has an input axle (3) connected to the motor (4) which gear mechanism comprises a first (24) and a second (25) output axle, which first (24) and second (25) axles are rotating in different directions around a common axis whereby the light forming means (6,8) are rotated in opposite directions around the common axis (24).

2. Drive according to claim 1 **characterized in** that the rotating movement for one of the light forming means is converted by the gear mechanism.

3. Drive according to claim 1 or 2 **characterized in** that the light forming means (6,8) are color flags, which color flags are operating par wise, which color flags are moved into and out from the light path from different directions, which color flags are partly over lapping, which first color flag comprises a first color pattern, which second color flag comprises a second pattern, which first and second pattern are formed opposite each other.

4. Drive according to claim 1 or 2 **characterized in** that the light forming means (6,8) are color flags, which color flags are operating par wise, which color flags are moved into and out from the light path from different directions, which color flags are partly over lapping, which first color flag comprises a first color pattern, which second color flag comprises a second pattern, which first and second patterns has a common centre of rotation, which patterns are formed with mostly equal radial distance to the rotational centre, which pattern are designed with linear increasing filtering characteristic.

5. Drive according to one of the claim 1 or 2, **characterized in** that the light forming means (6,8) are dimmer means, which dimmer means comprises a first dimmer flag and a second dimmer flag, which dimmer flags are moved into and out from the light path from different directions, which first dimmer flag comprises a first pattern, which second dimmer flag comprises a second pattern, which first and second dimmer pattern are formed opposite each other.

6. Drive according to one of the claim 1 or 2, **characterized in** that the light forming means (6, 8) are effect wheels, which effect wheels are moved in opposite direction.

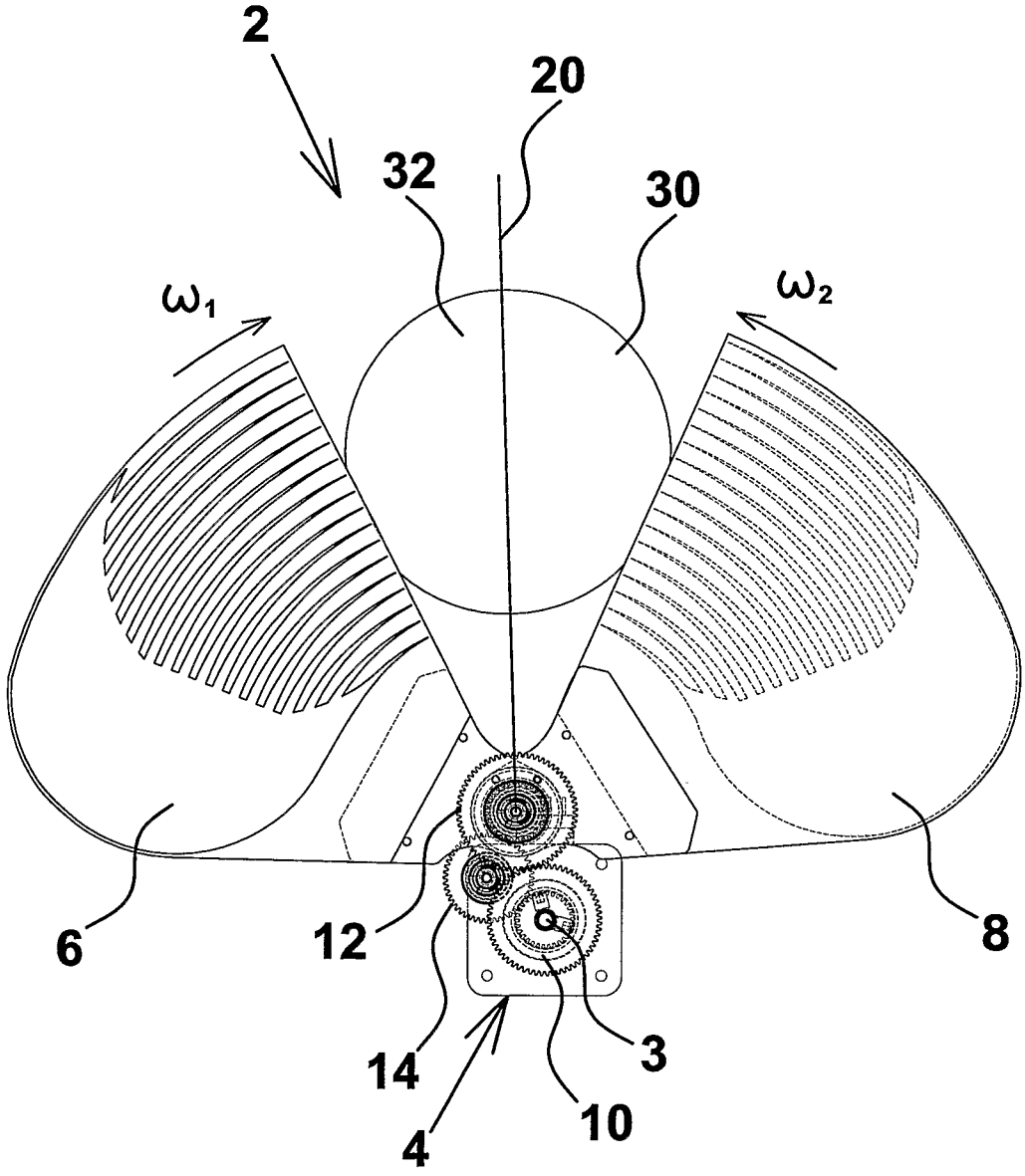


Fig. 1

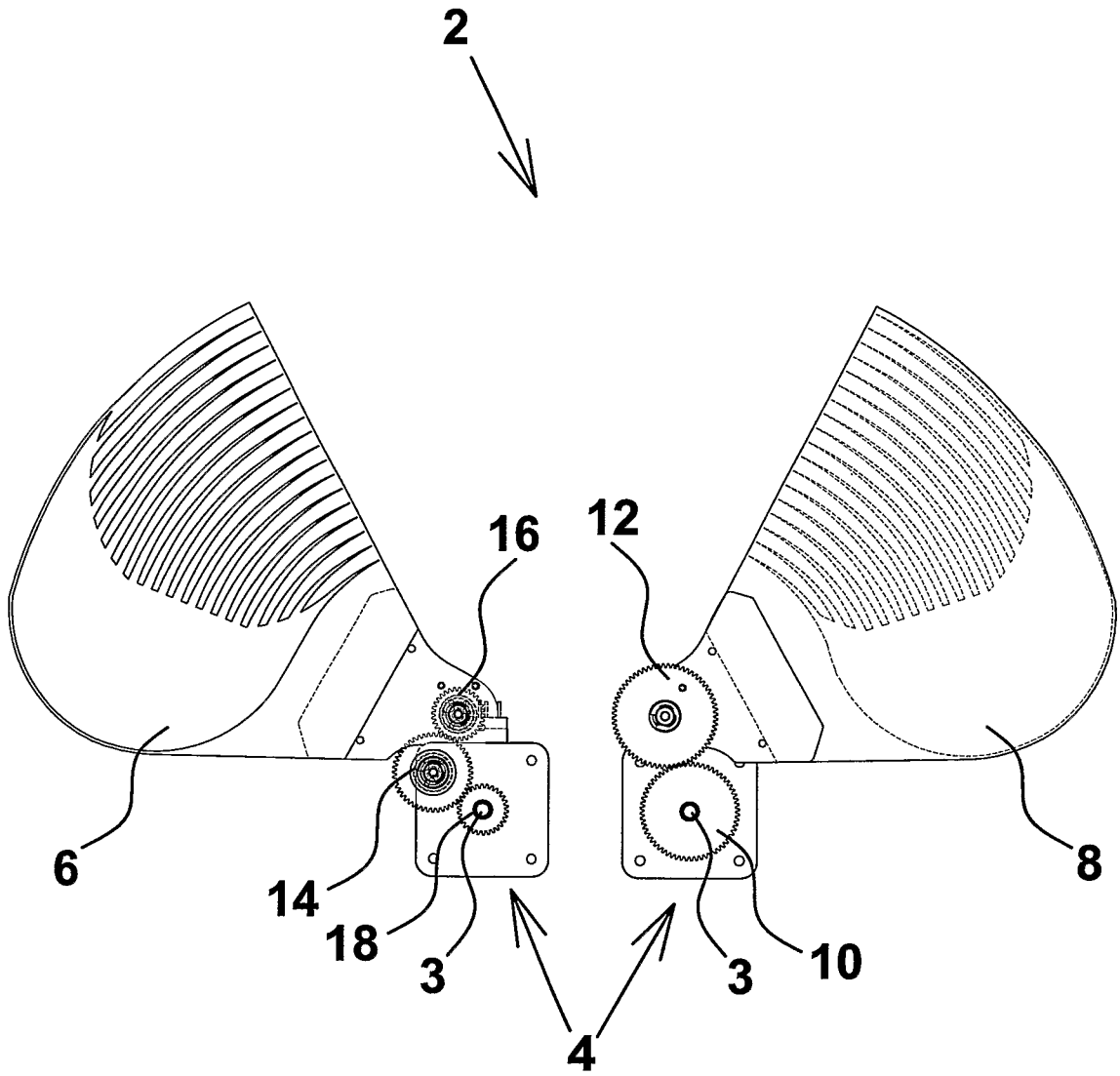


Fig. 2

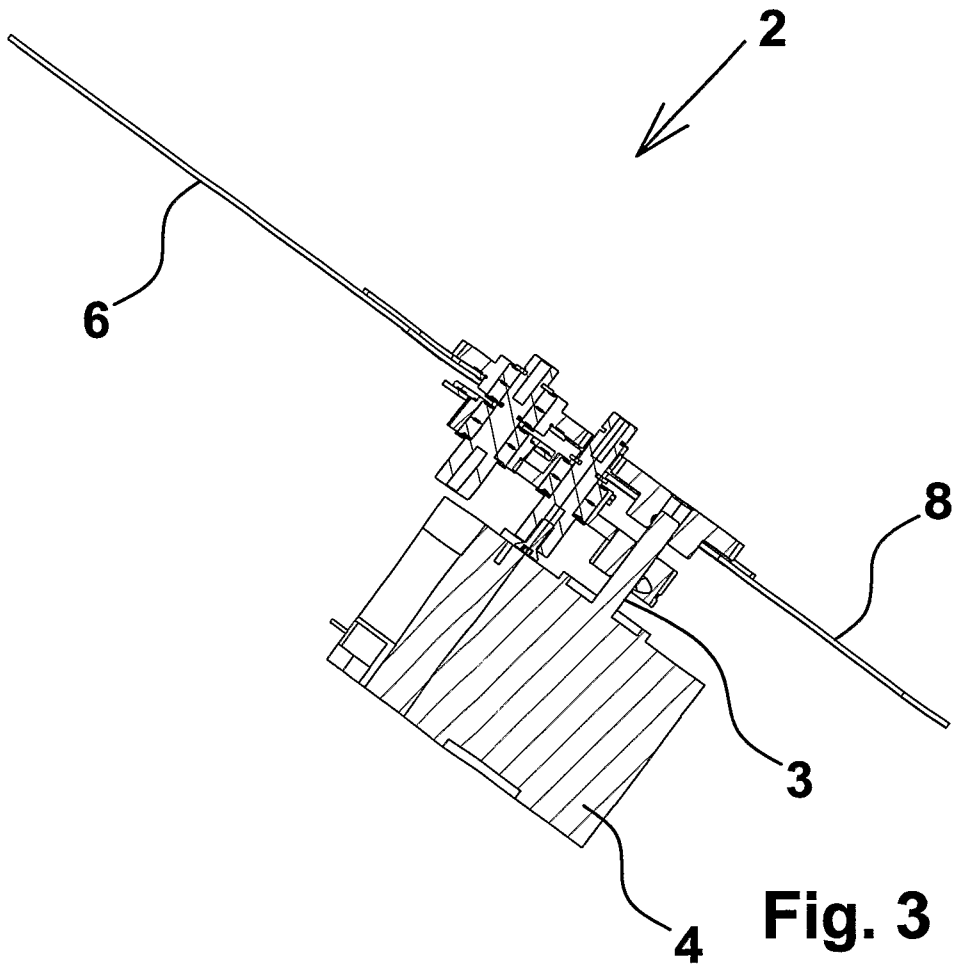


Fig. 3

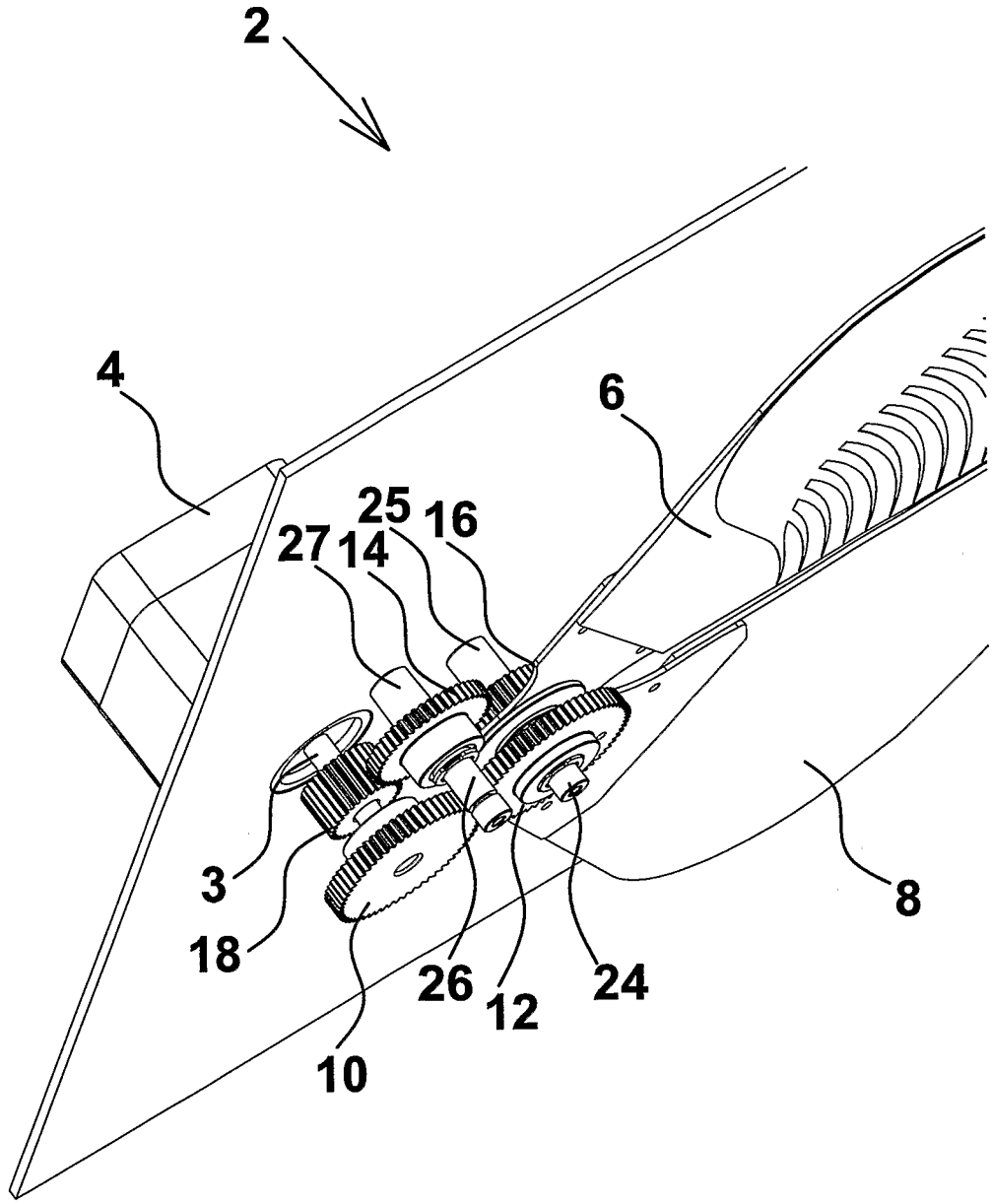


Fig. 4

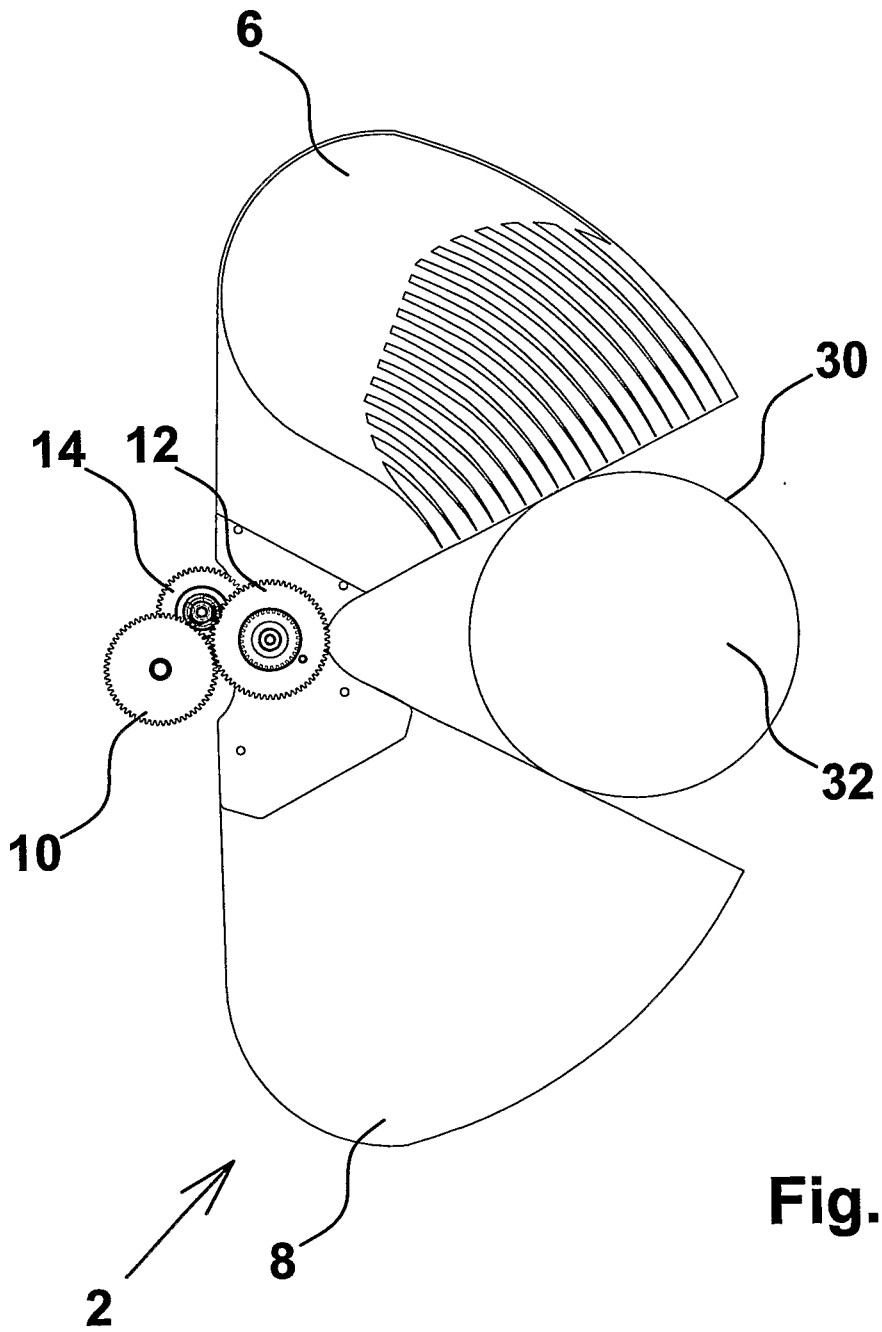


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2008/000018

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21S10/00

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)
F21S F21V

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 158 239 A (COEMAR SPA [IT]) 28 November 2001 (2001-11-28) paragraph [0001] - paragraph [0001]; figures 1-10	1-6
A	US 6 241 366 B1 (ROMAN BRIAN P [US] ET AL) 5 June 2001 (2001-06-05) column 1, line 35 - column 8, line 43; figures 1-14	1-6
P,A	EP 1 832 807 A (COEMAR SPA [IT]) 12 September 2007 (2007-09-12) paragraph [0015] - paragraph [0038]; figures 1-5	1-6

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search	Date of mailing of the international search report
8 April 2008	18/04/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Arboreanu, Antoniu

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/DK2008/000018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1158239 A	28-11-2001	IT MI20001132 A1	22-11-2001
US 6241366 B1	05-06-2001	NONE	
EP 1832807 A	12-09-2007	CN 101033831 A	12-09-2007
		US 2007211468 A1	13-09-2007