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Optical member driving device and projection display apparatus including the same

Abstract

An optical member driving device includes an optical member that light is incident on; and a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately before the light is incidence. Each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end of the arm, a conductor that is provided at a second end of the arm and extends in a direction from the second end toward the first end, the conductor being where a current flows, and a magnet pair that is provided to sandwich the second end of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the conductor extends.

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Background/Summary

BACKGROUND

1. Technical Field

(1) The present disclosure relates to an optical member driving device that shifts a projection position of image light, and a projection display apparatus including the optical member driving device.

2. Description of the Related Art

(2) For example, Patent Document 1 discloses an optical member driving device that shifts an image by changing an orientation of parallel plate glass through which image light is transmitted. The optical member driving device includes a coupling portion having one end rotatably supporting the parallel plate glass. Each of the plurality of coupling portions supports a different portion of the outer peripheral edge of the parallel plate glass. Further, each of the plurality of coupling portions rotates about a rotation center line passing through a center of the coupling portion. Moreover, the other end of each of the plurality of coupling portions is shifted by a movable portion of an actuator that strokes in a traveling direction of light immediately before its transmission through the parallel plate glass.

(3) Patent Literature 1 described above is Unexamined Japanese Patent Publication No. 2006-310138.

SUMMARY

(4) However, in a case of the optical member driving device described in Patent Literature 1, since the movable portion of the actuator strokes in the light traveling direction, the size of the optical member driving device increases, particularly, the size thereof in the light traveling direction increases.

(5) Therefore, an object of the present disclosure is to reduce the size of an optical member driving device that changes an orientation of an optical member.

(6) In order to solve the problem described above, according to one aspect of the present disclosure, there is provided an optical member driving device including: an optical member that light is incident on; a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately before the light is incidence on the optical member. Each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end of the arm, a conductor that is provided at a second end of the arm and extends in a direction from the second end toward the first end of the arm, the conductor being where a current flows, and at least one magnet pair that is provided to sandwich the second end of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the conductor extends.

(7) Further, according to another aspect of the present disclosure, there is provided a projection display apparatus including: a light source; a light modulation element that converts light from the light source into image light; the optical member driving device described above that the image light from the light modulation element is incident on; and a projection lens that projects the image light emitted from the optical member driving device.

(8) According to the present disclosure, it is possible to reduce the size of an optical member driving device that changes the orientation of the optical member.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. 1 is a schematic configuration diagram of a projection display apparatus as an example provided with an optical member driving device according to one exemplary embodiment of the

present disclosure;

(2) FIG. 2 is a perspective view of the optical member driving device according to one exemplary embodiment;

(3) FIG. 3 is a top view of the optical member driving device;

(4) FIG. 4 is a partial cross-sectional view of the optical member driving device in a state where image light is transmitted;

(5) FIG. 5 is a diagram illustrating a structure of a magnetic field generation unit;

(6) FIG. 6A is a partial cross-sectional view of the optical member driving device in a state where image light is shifted to one side in a width direction;

(7) FIG. 6B is a partial cross-sectional view of the optical member driving device in a state where the image light is shifted to the other side in the width direction; and

(8) FIG. 7 is a top view of an optical member driving device according to another exemplary embodiment.

DETAILED DESCRIPTIONS

(9) An optical member driving device according to an aspect of the present disclosure includes: an optical member on which light is incident; a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately before the light is incidence on the optical member. Each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end of the arm, a conductor that is provided at a second end of the arm and extends in a direction from the second end of the arm toward the first end, and through which a current flows, and at least one magnet pair that is provided to sandwich the second end of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the conductor extends.

(10) According to such an aspect, it is possible to reduce the size of the optical member driving device that changes the orientation of the optical member.

(11) For example, the conductor may be a coil including a first linear portion extending from the second end of the arm toward the first end and a second linear portion extending parallel to the first linear portion. In this case, the at least one magnet pair described above includes a first magnet pair that is provided to sandwich the first linear portion and generates a magnetic field in a direction intersecting with an extending direction of the first linear portion, and a second magnet pair that is provided to sandwich the second linear portion and generates a magnetic field in a direction opposite to the direction of the magnetic field of the first magnet pair.

(12) For example, the optical member driving device may include an elastic member that is connected to the first end of the arm and supports the optical member.

(13) For example, the optical member may have a circular shape as viewed in the traveling direction, and the plurality of actuators may be provided at intervals of 90 degrees as viewed in the traveling direction.

(14) For example, the optical member may be parallel plate glass through which light is transmitted.

(15) Further, a projection display apparatus according to another aspect of the present disclosure includes: a light source; a light modulation element that converts light from the light source into image light; the optical member driving device described above on which the image light from the light modulation element is incident; and a projection lens that projects the image light emitted from the optical member driving device.

(16) According to such an aspect, it is possible to reduce the size of the projection display apparatus.

(17) Hereinafter, an exemplary embodiment of the present disclosure will be described with reference to the drawings. However, an unnecessarily detailed description may be eliminated. For example, the detailed description of already well-known matters and the redundant description of a

configuration substantially identical to the already-described configuration may be eliminated. This is to avoid unnecessary redundancy in the following description and to facilitate understanding of those skilled in the art.

(18) Note that the attached drawings and the following description are provided for those skilled in the art to fully understand the present disclosure, and are not intended to limit the subject matter described in the appended claims.

(19) Hereinafter, an optical member driving device according to one exemplary embodiment of the present disclosure will be described with reference to the drawings.

(20) FIG. 1 is a schematic configuration diagram of a projection display apparatus as an example provided with an optical member driving device according to an exemplary embodiment of the present disclosure. Note that an XYZ Cartesian coordinate system illustrated in FIG. 1 is for facilitating understanding of the exemplary embodiment of the present disclosure and does not limit the exemplary embodiment. In the XYZ Cartesian coordinate system, an X-axis direction indicates a width direction of an image projected by the projection display apparatus, a Y-axis direction indicates a height direction of the image, and a Z-axis direction indicates a projection direction of the projection display apparatus.

(21) As illustrated in FIG. 1, projection display apparatus **10** as an example includes housing **12**, light source **14** provided in housing **12**, light modulation element **16** that is provided in housing **12** and converts light **L** from light source **14** into image light **L_m**, and projection lens **18** that projects the image light on screen **S**. Optical member driving device **20** is disposed between light modulation element **16** and projection lens **18**. Note that projection display apparatus **10** includes optical members (not illustrated) such as mirrors and prisms between light source **14** and light modulation element **16** and between light modulation element **16** and optical member driving device **20**.

(22) FIG. 2 is a perspective view of the optical member driving device according to one exemplary embodiment. FIG. 3 is a top view of the optical member driving device, and FIG. 4 is a partial cross-sectional view of the optical member driving device in a state where image light is transmitted.

(23) As illustrated in FIG. 3, optical member driving device **20** includes base **22**, optical member **24** on which image light **L_m** is incident, and a plurality of actuators **26A** to **26D** that change the orientation of optical member **24**.

(24) Base **22** of optical member driving device **20** functions as a bracket for attaching optical member driving device **20** to housing **12** of projection display apparatus **10**. Base **22** includes a through hole **22a** through which the image light from light modulation element **16** passes.

(25) In the case of the present exemplary embodiment, optical member **24** is parallel plate glass through which image light **L_m** having passed through through-hole **22a** of base **22** is transmitted. As illustrated in FIG. 3, optical member **24** has a circular shape as viewed in the traveling direction (Z-axis direction) of image light **L_m** immediately before its incidence on optical member **24**, and is attached to support frame **28**.

(26) The plurality of actuators **26A** to **26D** are provided on base **22** and support support frame **28** to which optical member **24** is attached. Note that the plurality of actuators **26A** to **26D** have substantially the same configuration.

(27) Each of the plurality of actuators **26A** to **26D** includes arm **30** and bearing **32** that rotatably supports arm **30**.

(28) Arm **30** of each of the plurality of actuators **26A** to **26D** includes one end **30a** (a first end) that supports optical member **24** and other end **30b** (a second end). Arm **30** is rotatably supported by bearing **32** at a portion between one end **30a** and other end **30b**. Specifically, respective arms **30** of the plurality of actuators **26A** to **26D** rotate about rotation center lines **C_a** to **C_d** extending in a direction perpendicular to the traveling direction (Z-axis direction) of image light **L_m** immediately before its incidence on optical member **24** as rotation axes. In the case of the present exemplary

embodiment, rotation center lines Ca, Cb of arms 30 of actuators 26A, 26B are parallel to each other, and rotation center lines Cc, Cd of arms 30 of actuators 26C, 26D are parallel to each other. (29) As illustrated in FIG. 3, one end 30a of arm 30 of each of the plurality of actuators 26A to 26D supports a different portion of the outer peripheral edge of optical member 24. In the case of the present exemplary embodiment, one end 30a of arm 30 of each of the plurality of actuators 26A to 26D supports a different portion of support frame 28 that supports optical member 24. In the case of the present exemplary embodiment, the plurality of actuators 26A to 26D are provided at intervals of 90 degrees as viewed in the traveling direction (Z-axis direction) of image light Lm immediately before its incidence on optical member 24. That is, actuators 26A, 26B face each other in the width direction (X-axis direction) with optical member 24 interposed therebetween, and actuators 26C, 26D face each other in the height direction (Y-axis direction) with optical member 24 interposed therebetween.

(30) In the case of the present exemplary embodiment, as illustrated in FIG. 2, one end 30a of arm 30 of each of the plurality of actuators 26A to 26D supports optical member 24 via elastic member 34. Elastic member 34 is, for example, a U-shaped spring. Instead of elastic member 34, one end 30a of arm 30 and support frame 28 of optical member 24 may be connected via a ball joint or the like.

(31) Each of the plurality of actuators 26A to 26D includes conductor 36 through which a current flows and magnetic field generation unit 38 that generates a magnetic field.

(32) As illustrated in FIG. 4, conductor 36 is provided at other end 30b corresponding to the point of force of arm 30 of each of the plurality of actuators 26A to 26D. In the case of the present exemplary embodiment, conductor 36 is a coil including a winding axis parallel to each of rotation center lines Ca to Cd of arm 30. Conductor 36 includes a plurality of first linear portions 36a extending from other end 30b toward one end 30a of arm 30, and a plurality of second linear portions 36b extending parallel to the first linear portions 36a. Therefore, when a current flows through conductor 36, a direction in which the current flows in first linear portion 36a is opposite to a direction in which the current flows in second linear portion 36b.

(33) FIG. 5 is a diagram illustrating a structure of a magnetic field generation unit.

(34) As illustrated in FIG. 5, magnetic field generation unit 38 includes a plurality of magnets 40 to 46. In the present exemplary embodiment, magnets 40, 42 form a pair (first magnet pair), and magnets 44, 46 form a pair (second magnet pair).

(35) The pair of magnets 40, 42 is provided to sandwich other end 30b of arm 30 at an interval. Thereby, the plurality of first linear portions 36a of conductor 36 provided at other end 30b of arm 30 are present between magnets 40, 42. In the case of the present exemplary embodiment, the pair of magnets 40, 42 in each of the plurality of actuators 26A to 26D is disposed to face each other in the extending direction of rotation center lines Ca to Cd of arm 30. As a result, the pair of magnets 40, 42 generates magnetic field M1 in a direction intersecting with the extending direction of first linear portion 36a.

(36) The pair of magnets 44, 46 is provided to sandwich other end 30b of arm 30 at an interval. Thereby, a plurality of second linear portions 36b of conductor 36 provided at other end 30b of arm 30 are present between the magnets 44, 46. In the case of the present exemplary embodiment, the pair of magnets 44, 46 in each of the plurality of actuators 26A to 26D is disposed to face each other in the extending direction of rotation center lines Ca to Cd of arm 30. As a result, the pair of magnets 44, 46 generates magnetic field M2 in a direction intersecting with the extending direction of second linear portion 36b. In the present exemplary embodiment, magnet 44 is disposed with an interval in the projection direction (Z-axis direction) with respect to magnet 40, and magnet 46 is disposed with an interval in the projection direction with respect to magnet 42.

(37) As illustrated in FIG. 5, the direction of magnetic field M1 generated by the pair of magnets 40, 42 and the direction of magnetic field M2 generated by the pair of magnets 44, 46 are opposite to each other. Thus, when a current flows through conductor 36, a driving force acts on other end

30b of arm **30**.

(38) For example, when a control device (not illustrated) of projection display apparatus **10** supplies a current to conductor **36** in actuator **26A**, as illustrated in FIG. 5, a current flows through the plurality of first linear portions **36a** of conductor **36**, and a current also flows through second linear portion **36b**. At this time, currents in directions opposite to each other flow through first linear portion **36a** and second linear portion **36b**. In FIG. 5, a current flowing in the depth direction from the front of the drawing flows through first linear portion **36a**, and a current flowing in the opposite direction flows through second linear portion **36b**.

(39) According to Fleming's left-hand rule, a force in a direction approaching base **22** is applied to first linear portion **36a** of conductor **36** in magnetic field **M1**. Similarly, a force in a direction approaching base **22** is also applied to second linear portion **36b** of conductor **36** in magnetic field **M2** in a direction opposite to the direction of magnetic field **M1**. Thereby, driving force F_d for shifting other end **30b** toward base **22** is generated at other end **30b** of arm **30**. As a result, arm **30** rotates about rotation center line C_a . When a current in the opposite direction flows through conductor **36**, a driving force in the opposite direction (a direction in which other end **30b** is separated from base **22**) is generated.

(40) In the case of the present exemplary embodiment, Hall sensor **48** is provided in arm **30** of each of the plurality of actuators **26A** to **26D**. Specifically, as illustrated in FIG. 4, Hall sensor **48** is provided at other end **30b** of arm **30** so as to be located between magnets **40**, **44** (between magnets **42**, **46**) as viewed in the extending direction of each of rotation center lines C_a to C_d of arm **30** when no current is flowing through conductor **36**. Thus, when no current is flowing through conductor **36**, Hall sensor **48** is present at a position between magnetic field **M1** and magnetic field **M2**, that is, at a position where magnetic fields **M1**, **M2** cancel each other. When a current is flowing through conductor **36**, the current approaches one of magnetic fields **M1**, **M2**. Therefore, the control device (not illustrated) of projection display apparatus **10** can confirm the inclination state of arm **30** on the basis of the detection value of the magnetic field of Hall sensor **48**.

(41) The configuration of optical member driving device **20** has been described so far. The operation of optical member driving device **20** will be described below.

(42) FIG. 6A is a partial cross-sectional view of the optical member driving device in a state where the image light is shifted to one side in the width direction. FIG. 6B is a partial cross-sectional view of the optical member driving device in a state where the image light is shifted to the other side in the width direction.

(43) As illustrated in FIGS. 6A and 6B, the control device (not illustrated) of projection display apparatus **10** performs synchronization control on actuators **26A**, **26B** and performs a similar synchronization control on actuators **26C**, **26D**. Therefore, the operations of the actuators **26A**, **26B** will be described in detail, and the description of the operations of the actuators **26C**, **26D** will be omitted.

(44) As illustrated in FIG. 6A, the control device (not illustrated) of projection display apparatus **10** outputs a control current to conductor (coil) **36** of each of actuators **26A**, **26B** in order to shift image light L_m to the side of actuator **26A** (the left side in the drawing) by a distance d_w in the width direction (X -axis direction).

(45) When a current flows through conductor **36** of actuator **26A**, driving force F_u is generated, arm **30** of actuator **26A** rotates about rotation center line C_a (rotates clockwise in the drawing), and other end **30b** is shifted in a direction away from base **22**. As a result, one end **30a** of arm **30** of actuator **26A** approaches base **22**, and the portion of optical member **24** supported by one end **30a** is shifted in a direction approaching base **22** by distance d_s .

(46) At the same time, when a current flows through conductor **36** of actuator **26B**, driving force F_d is generated, arm **30** of actuator **26B** rotates about rotation center line C_b (rotates clockwise in the drawing), and other end **30b** is shifted in a direction approaching base **22**. As a result, one end **30a** of arm **30** of actuator **26B** is separated from base **22**, and the portion of optical member **24**

supported by one end **30a** is shifted in a direction away from base **22** by distance ds .

(47) By such synchronous operation of actuators **26A**, **26B**, optical member **24** is inclined to the side of actuator **26A** (the left side in the drawing) from the neutral state illustrated in FIG. **4**. As a result, image light Lm is shifted to the side of actuator **26A** (the left side in the drawing) by distance dw in the width direction (X-axis direction).

(48) Further, as illustrated in FIG. **6B**, the control device (not illustrated) of projection display apparatus **10** outputs a control current to conductor (coil) **36** of each of actuators **26A**, **26B** in order to shift image light Lm to the side of actuator **26B** (the right side in the drawing) by distance dw in the width direction (X-axis direction).

(49) When a current flows through conductor **36** of actuator **26A**, driving force Fd is generated, arm **30** of actuator **26A** rotates about rotation center line Ca (rotates counterclockwise in the drawing), and other end **30b** is shifted in a direction approaching base **22**. As a result, one end **30a** of arm **30** of actuator **26A** is separated from base **22**, and the portion of optical member **24** supported by one end **30a** is shifted in a direction away from base **22** by distance ds .

(50) At the same time, when a current flows through conductor **36** of actuator **26B**, driving force Fu is generated, arm **30** of actuator **26B** rotates about rotation center line Cb (rotates counterclockwise in the drawing), and other end **30b** is shifted in a direction away from base **22**. As a result, one end **30a** of arm **30** of actuator **26B** approaches base **22**, and the portion of optical member **24** supported by one end **30a** is shifted in a direction approaching base **22** by distance ds .

(51) By such synchronous operation of actuators **26A**, **26B**, optical member **24** is inclined to the side of actuator **26B** (the right side in the drawing) from the neutral state illustrated in FIG. **4**. As a result, image light Lm is shifted to the side of actuator **26B** (the right side in the drawing) by distance dw in the width direction (X-axis direction).

(52) The control device (not illustrated) of projection display apparatus **10** alternately and repeatedly executes the operations of actuators **26A**, **26B** illustrated in FIGS. **6A** and **6B** at high speed. At the same time, the control device executes similar repetitive high-speed operations of actuator **26C** and actuator **26D**. Thus, the control device of projection display apparatus **10** quadruples the density of pixels of a video projected on screen S . Specifically, by the high-speed repetitive operation of actuators **26A**, **26B**, **26C**, **26D** described above, optical member **24** is sequentially inclined at high speed in four directions corresponding to each side of actuators **26A**, **26B**, **26C**, and **26D**. Thereby, four images shifted by $\frac{1}{2}$ of the pixels in the width direction (X-axis direction) and the height direction (Y-axis direction) from optical member **24** are output substantially at the same time (i.e., distance dw is $\frac{1}{4}$ of the pixel). As a result, the resolution of the video projected on screen S is increased.

(53) According to the exemplary embodiment as described above, it is possible to reduce the size of optical member driving device **20** that changes the orientation of optical member **24**. In particular, the size in the traveling direction (Z-axis direction) of image light Lm immediately before its incidence on optical member **24** can be reduced. This enables a decrease in space between light modulation element **16** in which optical member driving device **20** is disposed and projection lens **18**, which results in a reduction in the size of projection display apparatus **10**.

(54) Although the present disclosure has been described above by taking the above exemplary embodiment as an example, the present disclosure is not limited thereto.

(55) For example, in the case of the above exemplary embodiment, as illustrated in FIG. **3**, arm **30** of each of the plurality of actuators **26A** to **26D** extends linearly in a radial direction of circular optical member **24**. However, the exemplary embodiment of the present disclosure is not limited thereto.

(56) FIG. **7** is a top view of an optical member driving device according to another exemplary embodiment.

(57) As illustrated in FIG. **7**, in optical member driving device **120** according to another exemplary embodiment, arm **130** of each of a plurality of actuators **126A** to **126D** extends in a tangential

direction of circular optical member **24** and bends. Even with such arm **130**, the orientation of optical member **24** can be changed in the same manner as arm **30** in the above exemplary embodiment. Further, with such arm **130**, it is possible to reduce the size of base **122**, in particular, the size in the width direction (X-axis direction) and the height direction (Y-axis direction). That is, it is possible to reduce the sizes of optical member driving device **120** and the projection display apparatus including the optical member driving device **120**.

(58) Further, in the case of the above exemplary embodiment, as illustrated in FIG. **2**, the optical member driving device includes four actuators **26A** to **26D**. However, the exemplary embodiment of the present disclosure is not limited thereto. For example, even three actuators can incline the optical member in four directions.

(59) Moreover, in the case of the above exemplary embodiment, as illustrated in FIG. **4**, conductor **36** that generates the driving force for shifting other end **30b** of arm **30** is a coil, but the exemplary embodiment of the present disclosure is not limited thereto. That is, the conductor is not limited to a coil so long as a current flows in the direction intersecting with the direction of the magnetic field.

(60) Furthermore, in the case of the above exemplary embodiment, as illustrated in FIG. **4**, optical member **24**, the orientation of which is changed by optical member driving device **20**, is parallel plate glass. However, the exemplary embodiment of the present disclosure does not limit the optical member to parallel plate glass. The optical member may be a mirror that reflects incident light.

(61) In addition, in the case of the above exemplary embodiment, as illustrated in FIG. **1**, optical member driving device **20** is used for projection display apparatus **10**. However, the exemplary embodiment of the present disclosure is not limited thereto. The optical member driving device can be used for a device other than the projection display apparatus, that is, a device in which the orientation of the optical member needs to be changed.

(62) That is, in a broad sense, an exemplary embodiment of the present disclosure is an optical member driving device according to an aspect of the present disclosure includes: an optical member on which light is incident; a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately before the light is incidence on the optical member. Each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end of the arm, a conductor that is provided at a second end of the arm and extends in a direction from the second end toward the first end of the arm, and through which a current flows, and a magnet pair that is provided to sandwich the second end of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the conductor extends.

(63) Furthermore, in a broad sense, another exemplary embodiment of the present disclosure is a projection display apparatus including: a light source; a light modulation element that converts light from the light source into image light; the optical member driving device described above on which the image light from the light modulation element is incident; and a projection lens that projects the image light emitted from the optical member driving device.

(64) As described above, the above exemplary embodiment has been described as examples of the techniques in the present disclosure. To this end, the drawings and detailed description are provided. Thus, in order to exemplify the technique described above, the components illustrated in the drawings and described in the detailed description include not only components essential for solving the problem but also components not essential for solving the problem. Therefore, the fact that such non-essential components are illustrated in the drawings or described in the detailed description should not immediately determine that these non-essential components are essential.

(65) Since the above exemplary embodiment is for exemplifying the techniques in the present disclosure, various changes, replacements, additions, omissions, and the like can be made within

the scope of the appended claims or the scope equivalent thereto.

(66) The present disclosure is applicable to a device in which the orientation of the optical member needs to be changed.

Claims

1. An optical member driving device comprising: an optical member that light is incident on; a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately before the light is incident on the optical member, wherein each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end of the arm, a conductor that is provided at a second end of the arm and extends in a direction from the second end toward the first end of the arm, the conductor being where a current flows, and at least one magnet pair that is provided to sandwich the second end of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the conductor extends, and wherein the conductor is a coil.
2. The optical member driving device according to claim 1, wherein the coil includes a first linear portion extending with a directional component in the direction from the second end to the first end of the arm.
3. The optical member driving device according to claim 2, wherein the coil includes a second linear portion extending parallel to the first linear portion, and the at least one magnet pair includes a first magnet pair that is provided to sandwich the first linear portion and generates a magnetic field in a direction intersecting with an extending direction of the first linear portion, and a second magnet pair that is provided to sandwich the second linear portion and generates a magnetic field in a direction opposite to the direction of the magnetic field of the first magnet pair.
4. The optical member driving device according to claim 1, further comprising an elastic member that is connected to the first end of the arm and supports the optical member.
5. The optical member driving device according to claim 1, wherein the optical member has a circular shape as viewed in the traveling direction, and the plurality of actuators are provided at intervals of 90 degrees as viewed in the traveling direction.
6. The optical member driving device according to claim 1, wherein the optical member is parallel plate glass that light is transmitted through.
7. A projection display apparatus comprising: a light source; a light modulation element that converts light from the light source into image light; the optical member driving device according to claim 1 that the image light from the light modulation element is incident on; and a projection lens that projects the image light emitted from the optical member driving device.
8. An optical member driving device comprising: an optical member that light is incident on; a plurality of actuators that shift the optical member in a traveling direction of the light immediately prior to the light being incident on the optical member, wherein each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction perpendicular to the traveling direction and supports the optical member at a first end side of the arm, and a coil that is provided at a second end side of the arm, the coil includes a first linear portion extending with a directional component in the direction from the second end side to the first end side of the arm, each of the plurality of actuators further includes at least one magnet pair that is provided to sandwich the second end side of the arm at an interval and generates a magnetic field in a direction intersecting with a direction where the coil extends, the coil includes a second linear portion extending parallel to the first linear portion, and the at least one magnet pair includes a first magnet pair that is provided to sandwich the first linear portion and generates a magnetic field in a direction intersecting with an extending direction of the first linear portion, and a second magnet pair that is provided to sandwich the second linear portion and generates a magnetic field in a

direction opposite to the direction of the magnetic field of the first magnet pair.

9. An optical member driving device comprising: an optical member that light is incident on; a plurality of actuators that shift different portions of an outer peripheral edge of the optical member in a traveling direction of the light immediately prior to the light being incident on the optical member, wherein each of the plurality of actuators includes an arm that rotates about a rotation center line extending in a direction intersecting with a direction including the traveling direction and supports the optical member at a first end side of the arm, a conductor that is provided at a second end side of the arm, the conductor being where a current flows, and a magnet that is provided at the second end side of the arm and generates a magnetic field in a direction intersecting with a direction where the conductor extends, and wherein the conductor is a coil.

10. The optical member driving device according to claim 9, wherein a winding axis of the coil is substantially parallel to an incidence surface of the optical member.

11. The optical member driving device according to claim 10, wherein the winding axis extends in a first direction, the incidence surface is a surface that light is incident on, and the incidence surface is on a plane defined by a second direction parallel to the first direction and a third direction intersecting with both the first and second directions.

12. The optical member driving device according to claim 10, wherein a plane intersecting with the winding axis is a plane defined by a direction in which the optical member is provided relative to the coil and the traveling direction of the light.

13. The optical member driving device according to claim 10, wherein a shape of the coil has a longitudinal direction and a transverse direction, and the longitudinal direction is a direction intersecting with the traveling direction of the light.
