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Dial and operating mechanism

Abstract

A first dial includes: a rotatable dial member having a shaft portion; a moving mechanism that moves the dial member in a Z1 direction; and a flexible print substrate having a first sensor that detects rotation of the dial member and a second sensor that detects a position of the dial member moved by the moving mechanism, in which the flexible print substrate is disposed on a Z1 direction side with respect to the shaft portion.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) This application claims priority under 35 U.S.C § 119(a) to Japanese Patent Application No. 2022-157494 filed on 30 Sep. 2022. The above application is hereby expressly incorporated by reference, in its entirety, into the present application.

BACKGROUND OF THE INVENTION

1. Field of the Invention

(2) The present invention relates to a dial and an operating mechanism used in an electronic apparatus.

2. Description of the Related Art

(3) A rotary encoder with a push switch disclosed in JP1997-265860A (JP-H9-265860A) comprises: a rotary contact plate having an operation knob (dial member); an attachment substrate comprising an elastic leg that elastically contacts the rotary contact plate to generate an elastic signal; a driving body that rotatably holds the rotary contact plate and is bonded to a side portion of the attachment substrate so as to be swingable parallel to an attachment substrate surface; a switch portion in which a dome-shaped movable contact is placed on a fixed contact planted on the

attachment substrate; and an L-shaped actuator that is formed in an L shape consisting of an arm perpendicular to the attachment substrate surface abutting on one end of the driving body and an arm that extends from the arm in a direction of the switch portion and whose tip abuts on the dome-shaped movable contact, the L-shaped actuator being held on the attachment substrate so as to be rotationally moved with an intersecting portion of both arms as a support shaft. In a case in which a force is applied to an operation knob against an elastic operating force of the dome-shaped movable contact, the rotary contact plate and the entire driving body swing, the driving body pushes and rotates the L-shaped actuator, and the tip of the arm of the L-shaped actuator pushes the dome-shaped movable contact downward, so that the dome-shaped movable contact reversely operated, causing a short circuit between switch terminals.

(4) A combined operation electric component disclosed in JP3920567B comprises: a rotary knob (dial member); a slider that rotates integrally with the rotary knob; a sliding pattern portion on which the slider slides; a movable component part that slidingly moves the rotary knob by pressing the rotary knob in a direction substantially orthogonal to an axis of the rotary knob; and a push button switch that has a dome-shaped click spring and is operated by being pushed by a pressing protrusion provided on the movable component part.

SUMMARY OF THE INVENTION

(5) An embodiment according to the technology of the present disclosure provides a dial and an operating mechanism capable of saving space in an axial direction and improving an efficiency of component arrangement.

(6) A dial according to one aspect according to the technology of the present disclosure comprises a dial member, a moving mechanism, and an electronic member, in which the electronic member is disposed on a first direction side with respect to a shaft portion. The dial member has a shaft portion and is rotatable. The moving mechanism moves the dial member in a first direction. The electronic member has a first sensor and a second sensor. The first sensor detects rotation of the dial member. The second sensor detects a position of the dial member moved by the moving mechanism.

(7) It is preferable that the first sensor is disposed in a direction away from the dial member with respect to an end part of the shaft portion. It is preferable that the dial is an operation dial disposed in an imaging apparatus.

(8) A dial according to another aspect according to the technology of the present disclosure comprises a dial member, a moving mechanism, and an electronic member, in which the first sensor is disposed in a direction away from the dial member with respect to an end part of the shaft portion.

(9) It is preferable that the dial further comprises: a prevention portion for preventing the electronic member from entering a rotation range of the dial member. It is preferable that the prevention portion is included in the moving mechanism.

(10) It is preferable that the electronic member includes a first mounting portion on which the first sensor is mounted, a second mounting portion on which the second sensor is mounted, and a first relay portion that connects the first mounting portion and the second mounting portion.

(11) It is preferable that the moving mechanism has two biasing members that bias the dial member in a second direction opposite to the first direction, and the first relay portion is disposed between the two biasing members.

(12) An operating mechanism according to one aspect according to the technology of the present disclosure comprises: the dial; and an operating portion, in which the electronic member includes a third mounting portion having a connecting portion with the operating portion, and a second relay portion that connects the second mounting portion and the third mounting portion, the operating portion includes a movable portion that moves in the second direction close to the dial and that has a first projection portion and a second projection portion protruding toward a dial side, and the second relay portion is disposed between the first projection portion and the second projection

portion.
(13) It is preferable that the dial further comprises: a rotation mechanism that rotates the dial member; a support member that is included in the rotation mechanism and rotatably supports the dial member; and a fastening member that screw-fastens the electronic member to the support member.
(14) It is preferable that the fastening member is disposed in a direction away from the dial member with respect to the support member. It is preferable that the first direction is a direction intersecting an axial direction of the shaft portion.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a rear perspective view of an imaging apparatus.
(2) FIG. **2** is a front perspective view of the imaging apparatus.
(3) FIG. **3** is a cross-sectional view of a main part of the imaging apparatus.
(4) FIG. **4** is an exploded perspective view of a dial according to an aspect of the present invention.
(5) FIG. **5** is an exploded perspective view of a dial as viewed from a bottom surface side.
(6) FIG. **6** is a perspective view showing a state where a flexible print substrate is removed from the dial according to the aspect of the present invention.
(7) FIG. **7** is a cross-sectional view of a main part of the dial as viewed from the bottom surface side.
(8) FIG. **8** is a perspective view of an operating mechanism in a second embodiment.
(9) FIG. **9** is an exploded perspective view of the operating mechanism.
(10) FIG. **10** is an exploded perspective view of an operating portion.
(11) FIG. **11** is a cross-sectional view of a main part of the operating mechanism as viewed from the bottom surface side.
DESCRIPTION OF THE PREFERRED EMBODIMENTS
First Embodiment
(12) As shown in FIG. **1**, a digital camera **10** comprises a camera body **11** and an interchangeable lens barrel **12**. A first dial **13**, a display **14**, an operation button **15**, and the like are provided on a back surface of the camera body **11**. The first dial **13** corresponds to a “dial” in the claims. The display **14** is a liquid crystal display (LCD), an organic electroluminescent display (OELD), or the like. The display **14** is used for displaying a live view image, displaying a captured image, displaying a setting menu, and the like.
(13) As shown in FIG. **2**, a lens mount **16** and a second dial **17** are provided on a front surface of the camera body **11**. The lens mount **16** has a circular imaging aperture **16**A. The lens barrel **12** is attachably and detachably attached to the lens mount **16**. In addition, a release switch **18**, an operation dial **19**, and the like are provided on an upper surface of the camera body **11**.
(14) An imaging element **21** is built in the camera body **11**. The imaging element **21** is, for example, a complementary metal oxide semiconductor (CMOS) image sensor, a charge coupled device (CCD) image sensor, or an organic thin film imaging element.
(15) The lens barrel **12** comprises a lens barrel body **22**, an imaging optical system **23**, and the like. The lens barrel body **22** has a cylindrical shape and holds the imaging optical system **23** therein, and is provided with a lens mount and a lens-side signal contact (not shown) at a rear end thereof. The imaging optical system **23** images subject light on the imaging element **21** in a case in which the lens barrel **12** is attached to the camera body **11**.
(16) The camera body **11** has a front case **11**A, a rear case **11**B, a top case **11**C, and a bottom case **11**D. The front case **11**A, the rear case **11**B, the top case **11**C, and the bottom case **11**D are combined to form an exterior case of the camera body **11**.

(17) As shown in FIG. **3**, the first dial **13** comprises a dial member **31**, a moving mechanism **32**, a rotation mechanism **33**, a flexible print substrate **34**, and a rotary plate **35**. The first dial **13** is incorporated in an upper portion on a back surface side of the camera body **11**.
(18) The dial member **31** is formed in a disk shape and has a shaft portion **36**. A knurl is formed on an outer peripheral surface of the dial member **31**. A through-hole **11**E is formed on a back surface of the top case **11**C, and a part of the dial member **31** protrudes to an outside of the camera body **11** through the through-hole **11**E.
(19) As will be described below, the dial member **31** is movable in Z1 and Z2 directions by the moving mechanism **32**, and is rotatable around a rotation axis CL parallel to Y1 and Y2 directions by the rotation mechanism **33**. In the present embodiment, the Z1 and Z2 directions are directions parallel to a front-back direction of the digital camera **10**. The Z2 direction is a direction opposite to the Z1 direction.
(20) The Y1 and Y2 directions are directions orthogonal to the Z1 and Z2 directions. The Y2 direction is a direction opposite to the Y1 direction. In addition, X1 and X2 directions are directions orthogonal to the Z1 and Z2 directions and the Y1 and Y2 directions. In the present embodiment, the X1 and X2 directions are left and right directions (see FIG. **4**) of the digital camera **10**. The X2 direction is a direction opposite to the X1 direction. In the present specification, the word “orthogonal” includes not only the meaning of perfect orthogonality but also the meaning of substantial orthogonality including errors allowed in design and manufacturing. The word “parallel” includes not only the meaning of perfect parallel but also the meaning of substantial parallel including errors allowed in design and manufacturing.
(21) In addition, in the present embodiment, the Z1 and Z2 directions are directions orthogonal to the rotation axis CL of the dial member **31**, but the present invention is not limited to this, and the Z1 and Z2 directions need only be directions intersecting the rotation axis CL.
(22) As shown in FIG. **4**, the rotation mechanism **33** comprises a support member **41**. The support member **41** is provided with a fitting portion **42** and a plate-shaped portion **43**. The support member **41** is also included in the moving mechanism **32**, as will be described below.
(23) The fitting portion **42** is formed in a rounded rectangular shape, that is, in a tubular shape having a cross section in which two semicircular shapes are connected by parallel straight lines. The fitting portion **42** has a fitting hole **42**A into which the shaft portion **36** of the dial member **31** is fitted. The support member **41** rotatably supports the dial member **31** by fitting the fitting hole **42**A and the shaft portion **36**.
(24) The rotary plate **35** is disposed at an end part **36**A of the shaft portion **36**. The rotary plate **35** is screw-fastened to the shaft portion **36** by screwing a screw member **37** that penetrates the rotary plate **35** and the shaft portion **36**. As described above, the shaft portion **36** penetrates the fitting portion **42**. Therefore, the rotary plate **35** disposed at the end part **36**A of the shaft portion **36** is located on a Y2 direction side of the plate-shaped portion **43**. The rotary plate **35** has irregularities on an outer periphery thereof, and rotation is detected by a first sensor **64**, which will be described below.
(25) As shown in FIG. **5**, the moving mechanism **32** comprises a fixing member **51**, two spring members **52**, and the support member **41**. The spring member **52** corresponds to a “biasing member” in the claims. The fixing member **51** is formed in a plate shape that is one size larger than the support member **41**. The fixing member **51** includes a moving hole portion **51**A, a camera body attachment portion **51**B, a positioning pin **51**C, a fastening portion **51**D, and two spring member accommodating portions **51**E.
(26) The moving hole portion **51**A is a through-hole having a rounded rectangular shape disposed along the Z1 and Z2 directions, and is fitted with the fitting portion **42** of the support member **41**. The moving hole portion **51**A is formed to have a dimension in the Z1 and Z2 directions longer than a dimension of the fitting portion **42**. Accordingly, the fitting portion **42**, that is, the support member **41** can move in the Z1 and Z2 directions along the moving hole portion **51**A. In a case in

which the fitting portion **42** is fitted into the moving hole portion **51**A, the plate-shaped portion **43** is located on the Y2 direction side of the fixing member **51**.

(27) The camera body attachment portion **51**B extends in the X1 and X2 directions, and has a through-hole through which a screw member **55** penetrates. The fixing member **51** is fixed to the top case **11**C, that is, an inside of an exterior of the camera body **11** by screwing the screw member **55** that penetrates the camera body attachment portion **51**B into the top case **11**C.

(28) A second mounting portion **62**, which will be described below, is attached to the positioning pin **51**C and the fastening portion **51**D. The spring member accommodating portion **51**E is a U-shaped frame portion formed on a bottom surface side (Y2 direction side) of the fixing member **51** and accommodating the spring member **52** therein.

(29) The plate-shaped portion **43** of the support member **41** includes a spring member attachment portion **43**A, an entry prevention portion **43**B, a positioning pin **43**C, a fastening portion **43**D, and a pressing protrusion **43**E. The spring member attachment portion **43**A is a pair of protruding portions protruding from an end part of the plate-shaped portion **43** in the Z1 direction. The spring member **52** is attached to the spring member attachment portion **43**A in parallel with the Z1 and Z2 directions.

(30) As shown in FIG. **6**, in a case in which the fitting portion **42** of the support member **41** is fitted into the moving hole portion **51**A, the spring member **52** attached to the spring member attachment portion **43**A is accommodated in the spring member accommodating portion **51**E of the fixing member **51**. Therefore, the spring member **52** is disposed to be interposed between the fixing member **51** and the support member **41**. Accordingly, the spring member **52** biases the support member **41** and the dial member **31** in the Z2 direction. In the moving mechanism **32**, in a case in which the dial member **31** is pressed in the Z1 direction, the moving hole portion **51**A guides the fitting portion **42**, and the dial member can move in the Z1 direction against the biasing of the spring member **52** (a state shown by a two-dot chain line in FIG. **3**). In addition, in a case in which the pressing against the dial member **31** is released, the moving mechanism **32** can bias the dial member **31** in the Z2 direction by the spring member **52** to return the dial member **31** to the initial position (a state shown by a solid line in FIG. **3**).

(31) A first mounting portion **61**, which will be described below, is attached to the positioning pin **43**C and the fastening portion **43**D. The pressing protrusion **43**E is a protrusion that is located between the spring member attachment portions **43**A and that protrudes from an end edge of the plate-shaped portion **43** in the Z1 direction. The entry prevention portion **43**B is a protrusion that protrudes from a bottom surface of the plate-shaped portion **43** in the Y2 direction (see FIG. **3**).

(32) The flexible print substrate **34** comprises the first mounting portion **61**, the second mounting portion **62**, a first relay portion **63**, a first sensor **64**, and a second sensor **65**. The first mounting portion **61** has a rectangular plate shape and has a fastening hole **61**A and a positioning hole **61**B. The first sensor **64** is mounted on an upper surface of the first mounting portion **61**. Two first sensors **64** are located on the same circumference about the rotation axis CL.

(33) The positioning hole **61**B is fitted with the positioning pin **43**C of the support member **41**. Accordingly, the positioning of the first mounting portion **61** with respect to the support member **41** is performed. The fastening hole **61**A is provided at a position matching the fastening portion **43**D of the support member **41**. The first mounting portion **61** is screw-fastened to the support member **41** by screwing a screw member **66** that penetrates the fastening hole **61**A into the fastening portion **43**D. The screw member **66** corresponds to a “fastening member” in the claims. The screw member **66** is disposed in a direction away from the dial member **31** with respect to the support member **41**, that is, in the Y2 direction.

(34) In the Y1 and Y2 directions, the first mounting portion **61** is attached to the plate-shaped portion **43** with a certain interval therebetween. This certain interval is a gap through which the rotary plate **35** can pass. As described above, the rotary plate **35** is located on the Y2 direction side of the plate-shaped portion **43** of the support member **41**. Therefore, the rotary plate **35** passes

through the gap between the plate-shaped portion **43** and the first mounting portion **61** spaced from the plate-shaped portion **43** by a certain interval.

(35) The first sensor **64** is an optical sensor, and uses, for example, a photo reflector. As described above, the first sensor **64** is mounted on the first mounting portion **61**. Therefore, the first sensor **64** is disposed in a direction away from the dial member **31**, that is, in the Y2 direction with respect to the rotary plate **35** located at the end part **36**A of the shaft portion **36**.

(36) The first sensor **64** has a light emitting section and a light receiving section. The light emitting section of the first sensor **64** emits light toward a projection portion **35**A of the rotary plate **35**, and the light receiving section receives the light reflected by the projection portion **35**A of the rotary plate **35**. Through the output from the first sensor **64**, the rotation of the dial member **31**, specifically, a rotation amount and a rotation direction of the dial member **31** can be detected.

(37) The second mounting portion **62** has a rectangular plate shape and is disposed in the Z1 direction with respect to the first mounting portion **61**. The second mounting portion **62** has a fastening hole **62**A and a positioning hole **62**B. The second sensor **65** is mounted on an upper surface of the second mounting portion **62**. The present invention is not limited to this, and a controller having a processor function may be mounted on the first mounting portion **61** and/or the second mounting portion **62**.

(38) The positioning hole **62**B is fitted with the positioning pin **51**C of the fixing member **51**. Accordingly, the positioning of the second mounting portion **62** with respect to the fixing member **51** is performed. The fastening hole **62**A is provided at a position matching the fastening portion **51**D of the fixing member **51**. The second mounting portion **62** is screw-fastened to the fixing member **51** by screwing a screw member **67** that penetrates the fastening hole **62**A into the fastening portion **51**D. In addition, the second mounting portion **62** supports the support member **41** in the Y1 direction. In the Y1 and Y2 directions, the second mounting portion **62** is attached to a bottom surface **51**F of the fixing member **51** with a certain interval therebetween. This certain interval is a gap through which the plate-shaped portion **43** of the support member **41** can pass.

(39) As described above, the plate-shaped portion **43** is located on the Y2 direction side of the fixing member **51**. Therefore, the plate-shaped portion **43** passes through the gap between the fixing member **51** and the second mounting portion **62** spaced from the fixing member **51** by a certain interval. Accordingly, the support member **41** can move in the Z1 and Z2 directions.

(40) The second sensor **65** is a mechanical switch. The second sensor **65** is disposed at a position facing the pressing protrusion **43**E of the support member **41**. In a case in which the support member **41** moves in the Z1 direction, the second sensor **65** receives the pressure from the pressing protrusion **43**E, and a pressed portion **65**A is pushed into a case **65**B (see FIG. **3**). By pushing the pressed portion **65**A, a contact (not shown) inside the case **65**B is turned on. Therefore, the second sensor **65** can detect a position of the dial member **31** moved by the moving mechanism **32**. In addition, in a case in which the pressing against the dial member **31** is released, the pressing against the pressed portion **65**A by the pressing protrusion **43**E is also released. In a case in which the pressing against the pressed portion **65**A is released, the pressed portion **65**A is biased by a biasing member (not shown) inside the case **65**B and returns to the initial position.

(41) The first relay portion **63** connects the first mounting portion **61** and the second mounting portion **62**. As described above, the first mounting portion **61** is fixed to the support member **41**, the second mounting portion **62** is fixed to the fixing member **51**, and the support member **41** is movable in the Z1 and Z2 directions with respect to the fixing member **51**. Therefore, the first relay portion **63** is formed to have a length with a margin in the Z1 and Z2 directions so as not to impede the movement of the support member **41**.

(42) As described above, the first relay portion **63** is formed to have a length with a margin, so that in a case in which the first relay portion **63** enters a range in which the dial member **31** rotates, the rotation of the dial member **31** is impeded. In the present embodiment, the entry prevention portion **43**B is provided to match a position of the first relay portion **63**. Since the entry prevention portion

43B moves in the Z1 and Z2 directions together with the support member **41**, the entry prevention portion **43**B abuts on the first relay portion **63** and prevents the first relay portion **63** from moving in a Z2 direction side. That is, the entry prevention portion **43**B prevents the first relay portion **63** from entering the range in which the dial member **31** rotates.

(43) As shown in FIG. **7**, the first relay portion **63** is disposed between the two spring members **52** that bias the support member **41** and the dial member **31**. The first relay portion **63** is a part of the flexible print substrate **34** and has a large reaction force. That is, in a case in which the first relay portion **63** receives the pressure from the support member **41**, a force for pushing back the support member **41** and the dial member **31** is large. In a case in which the first relay portion **63** is located on an outer side of the two spring members **52**, a reaction force on a side where the first relay portion **63** is located becomes large, and the operability deteriorates. On the other hand, in the present embodiment, the first relay portion **63** is disposed between the two spring members **52**, so that the force for pushing back the support member **41** and the dial member **31** is prevented from being biased, and the operability is improved. In addition, since there is a margin for component arrangement between the two spring members **52**, the efficiency of component arrangement can be improved by disposing the first relay portion **63** at this position.

(44) Next, an action of the digital camera **10** according to the present embodiment will be described. In a case of operating the first dial **13**, the moving mechanism **32** and the rotation mechanism **33** are provided as described above, so that the dial member **31** can be rotated and pressed, and a user can perform various operations. Further, in the first dial **13**, the flexible print substrate **34** is disposed on a Z1 direction side with respect to the shaft portion **36** of the dial member **31**. Accordingly, on the Z2 direction side of the shaft portion **36** (a range E surrounded by a dotted line in FIG. **3**), there is a margin for component arrangement. Further, it is possible to save space in the Y1 and Y2 directions which are the axial directions of the first dial **13**, and it is possible to improve the efficiency of component arrangement.

(45) In addition, in the first dial **13**, the first sensor **64** that detects the rotation is disposed in a direction away from the dial member **31**, that is, in the Y2 direction with respect to the end part **36**A of the shaft portion **36**, so that it is possible to save space in the Y1 and Y2 directions and to improve the efficiency of component arrangement. In a case in which, as in the dial in the related art, the first sensor that detects the rotation is disposed in a direction close to the dial member with respect to the end part of the shaft portion, a length of the shaft portion of the dial increases and components are disposed up to the end part of the shaft portion, which impedes space saving. On the other hand, in the present embodiment, the first sensor **64** is disposed in a direction away from the dial member **31** with respect to the end part **36**A of the shaft portion **36**, so that the shaft portion **36** can be made shorter than in the related art, which makes it possible to improve a degree of freedom in component arrangement. Accordingly, it is possible to save space.

(46) In the first embodiment, in the first dial **13**, the flexible print substrate **34** is disposed on the Z1 direction side with respect to the shaft portion **36** of the dial member **31**, and the first sensor **64** is disposed in a direction away from the dial member **31** with respect to the end part **36**A of the shaft portion **36**, but the present invention is not limited to this, and a part of the configuration may be omitted. For example, the limitation that the flexible print substrate **34** is disposed on the Z1 direction side with respect to the shaft portion **36** of the dial member **31** may be removed from the configuration of the first embodiment. Even in this case, the first sensor **64** is disposed in a direction away from the dial member **31** with respect to the end part **36**A of the shaft portion **36**, so that it is possible to save space and improve the efficiency of component arrangement.

(47) In addition, the limitation that the first sensor **64** is disposed in a direction away from the dial member **31** with respect to the end part **36**A of the shaft portion **36** may be removed from the configuration of the first embodiment. Even in this case, the flexible print substrate **34** is disposed on the Z1 direction side with respect to the shaft portion **36** of the dial member **31**, so that there is a margin in the space on the Z2 direction side of the shaft portion **36**, which enables space saving and

improves the efficiency of component arrangement.

Second Embodiment

(48) In the first embodiment described above, the configuration to which the dial according to the embodiment of the present invention is applied is illustrated, but the present invention is not limited to this, and, in a second embodiment described below, an operating mechanism including a dial and other operating portions is applied.

(49) As shown in FIG. **8**, an operating mechanism **70** of the present embodiment comprises a first dial **71** and a second dial **72**. The operating mechanism **70** is incorporated in the camera body **11** of the digital camera **10** as in the first embodiment. The first dial **71** has the same configuration as the first dial **13** of the first embodiment, except for a configuration of a flexible print substrate **73**. The second dial **72** corresponds to an "operating portion" in the claims. The same components and members as those in the first embodiment are denoted by the same reference numerals, and the description thereof will be omitted.

(50) The first dial **71** comprises a dial member **31**, a moving mechanism **32**, a rotation mechanism **33**, a flexible print substrate **73**, and a rotary plate **35**. The flexible print substrate **73** has a third mounting portion **74** and a second relay portion **75** in addition to the configuration of the flexible print substrate **34** according to the first embodiment. The first mounting portion **61**, the second mounting portion **62**, the first relay portion **63**, the first sensor **64**, and the second sensor **65** constituting the flexible print substrate **73** are the same as those of the flexible print substrate **34** in the first embodiment.

(51) The third mounting portion **74** is provided with a connector **76**. The connector **76** is a connecting portion with the second dial **72**. The third mounting portion **74** is disposed at a position that does not impede with the operation of the moving mechanism **32** and the rotation mechanism **33**. For example, the third mounting portion **74** is disposed at a position in the Y1 direction or the Y2 direction with respect to the first mounting portion **61** and the second mounting portion **62**.

(52) The second relay portion **75** connects the second mounting portion **62** and the third mounting portion **74**. From a positional relationship between the second mounting portion **62** and the third mounting portion **74** described above, the second relay portion **75** is disposed at a position extending from the second mounting portion **62** in the Y2 direction and turning around to the Y2 direction side of the third mounting portion **74**.

(53) As shown in FIG. **10**, the second dial **72** includes at least a dial member **81**, a movable portion **82**, a fixed portion **83**, and a flexible print substrate **84**. The second dial **72** is disposed, for example, at the same position as the second dial **17** in the first embodiment with respect to the camera body **11**. The flexible print substrate **84** is provided with a connection terminal at an end part **84**A and is connected to the connector **76** of the first dial **71**. A sensor that detects a position of the dial member **81** and/or a controller is mounted on the flexible print substrate **84**.

(54) The movable portion **82** constitutes a moving mechanism that moves in the Z1 and Z2 directions together with the dial member **81**. As with the dial member **31**, the dial member **81** is a rotatable dial member that has a shaft portion. The fixed portion **83** is a member that is fixed to the inside of the exterior of the camera body **11**.

(55) In the present embodiment, the movable portion **82** moves in the Z2 direction, that is, in a direction close to the first dial **71**. The movable portion **82** has a first projection portion **82**A and a second projection portion **82**B that protrudes toward the first dial **71**. The first projection portion **82**A and the second projection portion **82**B are coupling portions for coupling the movable portion **82** to the fixed portion **83**, and are fastened or fitted to, for example, a screw member **85** which is a fastening member. The movable portion **82** may be a member that serves as both the rotation mechanism and the moving mechanism, or may be a member that moves to simply press the switch, as with the support member **41** of the first embodiment.

(56) As shown in FIG. **11**, the second relay portion **75** is disposed between the first projection portion **82**A and the second projection portion **82**B. A sensor or the like is disposed at a position

between the first projection portion **82**A and the second projection portion **82**B, but there is a margin in the space at a position where the first projection portion **82**A and the second projection portion **82**B protrude toward the first dial **71**. Therefore, in the present embodiment, in addition to the effect of the first embodiment, the efficiency of component arrangement can be improved by disposing the second relay portion **75** between the first projection portion **82**A and the second projection portion **82**B.

(57) In each of the above-described embodiments, the second sensor **65** uses a mechanical switch, but the present invention is not limited to this. The sensor need only be a sensor that is switched on/off in response to the movement of the dial member **31** by the moving mechanism, for example, an optical sensor may detect a position of the dial and/or a member that moves with the dial, and may electrically detect the position by bringing contacts constituting an electrical contact type switch into contact and/or non-contact state.

(58) The dial according to the embodiment of the present invention is not limited to the operation dial of the digital camera, and can also be applied to the operation dial of an imaging apparatus such as a smartphone or a video camera.

APPENDIX 1

(59) A dial comprising: a rotatable dial member having a shaft portion; and an electronic member having a first sensor that detects rotation of the dial member, in which the first sensor is disposed in a direction away from the dial member with respect to an end part of the shaft portion.

APPENDIX 2

(60) A dial comprising: a rotatable dial member having a shaft portion; a moving mechanism that moves the dial member in a first direction; and an electronic member having a second sensor that detects a position moved by the moving mechanism, in which the electronic member is disposed on a first direction side with respect to the shaft portion.

EXPLANATION OF REFERENCES

(61) **10**: digital camera **11**: camera body **11**A: front case **11**B: rear case **11**C: top case **11**D: bottom case **11**E: through-hole **12**: lens barrel **13**: first dial **14**: display **15**: operation button **16**: lens mount **16**A: imaging aperture **17**: second dial **18**: release switch **19**: operation dial **21**: imaging element **22**: lens barrel body **23**: imaging optical system **31**: dial member **32**: moving mechanism **33**: rotation mechanism **34**: flexible print substrate **35**: rotary plate **35**A: projection portion **36**: shaft portion **36**A: end part **37**: screw member **41**: support member **42**: fitting portion **42**A: fitting hole **43**: plate-shaped portion **43**A: spring member attachment portion **43**B: entry prevention portion **43**C: positioning pin **43**D: fastening portion **43**E: pressing protrusion **51**: fixing member **51**A: moving hole portion **51**B: camera body attachment portion **51**C: positioning pin **51**D: fastening portion **51**E: spring member accommodating portion **51**F: bottom surface **52**: spring member **55**: screw member **61**: first mounting portion **61**A: fastening hole **61**B: positioning hole **62**: second mounting portion **62**A: fastening hole **62**B: positioning hole **63**: first relay portion **64**: first sensor **65**: second sensor **65**A: pressed portion **65**B: case **66**: screw member **67**: screw member **70**: operating mechanism **71**: first dial **72**: second dial **73**: flexible print substrate **74**: third mounting portion **75**: second relay portion **76**: connector **81**: dial member **82**: movable portion **82**A: first projection portion **82**B: second projection portion **83**: fixed portion **84**: flexible print substrate **84**A: end part **85**: screw member

Claims

1. A dial comprising: a rotatable dial member having a shaft portion; a moving mechanism that moves the dial member in a first direction; and an electronic member having a first sensor that detects rotation of the dial member and a second sensor that detects a position of the dial member moved by the moving mechanism, wherein the electronic member is disposed on a first direction side with respect to the shaft portion.

2. The dial according to claim 1, wherein the first sensor is disposed in a direction away from the dial member with respect to an end part of the shaft portion.
3. The dial according to claim 1, wherein the dial is an operation dial disposed in an imaging apparatus.
4. The dial according to claim 1, further comprising: a prevention portion for preventing the electronic member from entering a rotation range of the dial member.
5. The dial according to claim 4, wherein the prevention portion is included in the moving mechanism.
6. The dial according to claim 1, wherein the electronic member includes: a first mounting portion on which the first sensor is mounted; a second mounting portion on which the second sensor is mounted; and a first relay portion that connects the first mounting portion and the second mounting portion.
7. The dial according to claim 6, wherein the moving mechanism has two biasing members that bias the dial member in a second direction opposite to the first direction, and the first relay portion is disposed between the two biasing members.
8. An operating mechanism comprising: the dial according to claim 7; and an operating portion, wherein the electronic member includes: a third mounting portion having a connecting portion with the operating portion; and a second relay portion that connects the second mounting portion and the third mounting portion, the operating portion includes a movable portion that moves in the second direction close to the dial and that has a first projection portion and a second projection portion protruding toward a dial side, and the second relay portion is disposed between the first projection portion and the second projection portion.
9. The dial according to claim 1, further comprising: a rotation mechanism that rotates the dial member; a support member that is included in the rotation mechanism and rotatably supports the dial member; and a fastening member that screw-fastens the electronic member to the support member.
10. The dial according to claim 9, wherein the fastening member is disposed in a direction away from the dial member with respect to the support member.
11. The dial according to claim 1, wherein the first direction is a direction intersecting an axial direction of the shaft portion.
12. A dial comprising: a rotatable dial member having a shaft portion; a moving mechanism that moves the dial member in a first direction; and an electronic member having a first sensor that detects rotation of the dial member and a second sensor that detects a position of the dial member moved by the moving mechanism, wherein the first sensor is disposed in a direction away from the dial member with respect to an end part of the shaft portion.