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Endoscope having a joining portion in which liquid and gas join

Abstract

An endoscope capable of preventing a liquid in a liquid path from being sucked up and injected together with a gas at the time of an air supply operation. In an endoscope including a liquid path through which a liquid passes and a gas path through which a gas passes, and in which a joining recessed portion in which the liquid and the gas join is formed in a distal end portion, one end side of the liquid path and one end side of the gas path communicate with the joining recessed portion, and a size of a first communication hole between the gas path and the joining recessed portion is made larger than a size of a second communication hole between the liquid path and the joining recessed portion.

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USPC: 600/156; 600/159

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Background/Summary

TECHNICAL FIELD

(1) The present invention relates to an endoscope in which a joining recessed portion in which a liquid and a gas join is formed in a distal end portion.

(2) The present application claims priority based on Japanese Patent Application No. 2020-167753 filed on Oct. 2, 2020, the entire contents of which are incorporated herein by reference.

BACKGROUND ART

(3) Conventionally, an endoscope having a gas path and a liquid path and in which distal ends of the gas path and the liquid path communicate with each other in a distal end portion of an insertion portion to be inserted into a body cavity has been widely used.

(4) For example, Patent Literature 1 discloses an endoscope in which the size of an opening of an air supply passage pipe (gas path) is made smaller than the size of an opening of a nozzle that injects air or water at a communication portion between the air supply passage pipe and a water supply passage pipe (liquid path), whereby water does not flow back into the air supply passage pipe side at the time of a water supply operation, and water droplets can be suppressed from being ejected together with air at the time of a subsequent air supply operation.

CITATION LIST

Patent Literature

(5) Patent Literature 1: JP 2007-190118 A

SUMMARY OF INVENTION

Technical Problem

(6) Meanwhile, in an endoscope in which a joining recessed portion in which a liquid and a gas join is formed in a distal end portion of an insertion portion, and the liquid or the gas flows to a nozzle via the joining recessed portion, there may be a problem that the liquid in a liquid path is sucked up due to a pressure difference between the inside of the joining recessed portion and the inside of the liquid path and is injected through the nozzle together with the gas at the time of an air supply operation of injecting only the gas through the nozzle.

(7) However, the endoscope of Patent Literature 1 does not consider such a problem and cannot solve the problem.

(8) The present invention has been made in view of such circumstances, and an object thereof is to provide an endoscope capable of preventing a liquid in a liquid path from being sucked up and injected together with a gas at the time of an air supply operation.

Solution to Problem

(9) An endoscope according to the present invention includes a liquid path through which a liquid passes and a gas path through which a gas passes, and in which a joining recessed portion in which the liquid and the gas join is formed in a distal end portion. One end side of the liquid path and one end side of the gas path communicate with the joining recessed portion, and a size of a first communication hole between the gas path and the joining recessed portion is larger than a size of a second communication hole between the liquid path and the joining recessed portion.

(10) In the present invention, since the size of the first communication hole between the gas path

and the joining recessed portion is larger than the size of the second communication hole between the liquid path and the joining recessed portion, an increase in speed of air in a vicinity of the first communication hole is suppressed and the liquid in the liquid path is prevented from being sucked up in the case of the air supply operation of injecting only the gas through the nozzle.
Advantageous Effects of Invention
(11) According to the present invention, a liquid in a liquid path can be prevented from being sucked up and injected together with a gas at the time of an air supply operation.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) FIG. **1** is an external view of an endoscope according to a first embodiment of the present invention.
(2) FIG. **2** is a schematic view illustrating a distal end surface of a distal end portion of the endoscope.
(3) FIG. **3** is a partial cross-sectional view for describing a configuration of the distal end portion.
(4) FIG. **4** is an enlarged view illustrating a portion of a joining recessed portion in FIG. **3** in an enlarged manner.
(5) FIG. **5** is a cross-sectional view taken along line V-V of FIG. **4**.
(6) FIG. **6** is a cross-sectional view taken along line VI-VI of FIG. **4**.
(7) FIG. **7** is an explanatory view for describing a communication state between the joining recessed portion and an air supply connection portion.
(8) FIG. **8** is simulation results illustrating flow of air in a case where sizes of a first communication hole and a second communication hole are the same and in a case where the size of the first communication hole is larger than the size of the second communication hole.
(9) FIG. **9** is an enlarged view illustrating a portion of a joining recessed portion in an enlarged manner of an endoscope according to a second embodiment.
(10) FIG. **10** is an enlarged view illustrating a portion of a joining recessed portion in an enlarged manner of an endoscope according to a third embodiment.
DESCRIPTION OF EMBODIMENTS
(11) Hereinafter, an endoscope according to embodiments of the present invention will be described in detail with reference to the drawings.
First Embodiment
(12) FIG. **1** is an external view of an endoscope **10** according to a first embodiment of the present invention. The endoscope **10** according to the present embodiment includes an imaging means, and is provided with an insertion portion **14** to be inserted into a body cavity of a subject, an operation unit **20** for operating the insertion portion **14**, and a connector unit **24** connected with a processor, a light source device, an air supply/water supply device, and the like, which are not illustrated.
(13) The insertion portion **14** is connected with the operation unit **20** via a bend preventing portion **16**, and the operation unit **20** is connected with the connector unit **24** via a universal cord **25**.
(14) The universal cord **25** has pliability, and includes an electric line that sends an electric signal from an imaging means of the insertion portion **14** to the connector unit **24**, and a water passage through which water passes and an air passage through which air passes, which are sent from the connector unit **24**.
(15) The operation unit **20** includes a grip portion **205**, buttons **201** each for receiving an instruction such as water feed or air feed from the user, and a bending knob **21** for operating bending of a bending section **12** to be described below.
(16) The grip portion **205** has a substantially cylindrical shape, and is reduced in diameter toward the insertion portion **14**. The grip portion **205** is provided with a channel inlet **22**, into which a

treatment tool or the like is to be inserted, near the insertion portion **14** side.
(17) The insertion portion **14** has a cylindrical shape with a small diameter, and is configured to be bendable. A distal end portion **13**, a bending section **12**, and a soft portion **11** are provided in this order from one end of the distal end side. The bending section **12** is bent according to an operation of the bending knob **21**.
(18) The distal end portion **13** has a columnar shape, and accommodates an imaging unit (not illustrated) including an imaging means such as a charge coupled device (CCD) or a complementary metal oxide semiconductor (CMOS), an observation optical system, and the like.
(19) FIG. **2** is a schematic view illustrating a distal end surface **131** of the distal end portion **13** of the endoscope **10**. The distal end surface **131** of the distal end portion **13** has a circular shape. The distal end portion **13** is provided with an observation optical system **132**, an air supply/water supply nozzle **140**, a channel outlet **18**, an illumination optical system **133**, and the like.
(20) Two illumination optical systems **133** are provided on the distal end surface **131** in a separated manner from each other, and the observation optical system **132** is provided between the two illumination optical systems **133**. Further, the air supply/water supply nozzle **140** and the channel outlet **18** are provided at a distance from the observation optical system **132** in the distal end surface **131**. The air supply/water supply nozzle **140** injects air or water toward the observation optical system **132**, and the illumination optical system **133** emits irradiation light to illuminate an object.
(21) FIG. **3** is a schematic cross-sectional view for describing a configuration of the distal end portion **13**.
(22) A joining recessed portion **134** in which air and water sent from the operation unit **20** join is formed in the distal end surface **131** of the distal end portion **13**, and a part of the air supply/water supply nozzle **140** is engaged with the joining recessed portion **134**.
(23) The joining recessed portion **134** has a circular shape in cross-sectional view and extends in an axial length direction of the distal end portion **13**. One end side of the joining recessed portion **134**, the one end side being closer to the distal end surface **131** in a longitudinal direction, is engaged with the air supply/water supply nozzle **140**. Further, the other end side of the joining recessed portion **134** communicates with a gas path **30** and a liquid path **40** to be described below.
(24) The air supply/water supply nozzle **140** includes a cylindrical portion **143** having a circular shape in cross-sectional view, and a lid portion **142** that covers an opening end on one end side of the cylindrical portion **143**. The lid portion **142** and the cylindrical portion **143** are integrally formed. The cylindrical portion **143** has an outer diameter slightly smaller than an inner diameter of the joining recessed portion **134**, and most of the cylindrical portion is internally fitted into the joining recessed portion **134**. The lid portion **142** has a disk shape and has a diameter larger than the outer diameter of the cylindrical portion **143**. In a state where the air supply/water supply nozzle **140** is engaged with the joining recessed portion **134**, only the lid portion **142** is exposed on the distal end surface **131**.
(25) Further, the air supply/water supply nozzle **140** has an outlet **141** through which air or water is emitted. The outlet **141** has a substantially oval shape and opens toward the observation optical system **132**. The outlet **141** is provided on the lid portion **142** side in the cylindrical portion **143**.
(26) As described above, the other end side of the joining recessed portion **134** communicates with the gas path **30** and the liquid path **40**. The gas path **30** supplies a gas (for example, air) sent from the air supply/water supply device to the air supply/water supply nozzle **140**. Further, the liquid path **40** supplies a liquid (for example, water) sent from the air supply/water supply device to the air supply/water supply nozzle **140**.
(27) The gas path **30** includes an air supply tube **32** and an air supply connection portion **31**. The air supply tube **32** communicates with the other end side of the joining recessed portion **134** via the air supply connection portion **31**. Further, the air supply tube **32** penetrates the insertion portion **14** in the longitudinal direction, and is provided so as to straddle the bending section **12** and the distal

end portion **13**. That is, one end of the air supply tube **32** is connected to the air supply connection portion **31**, and the other end of the air supply tube **32** is connected to the air supply/water supply device through the operation unit **20** and the connector unit **24**.

(28) Further, the liquid path **40** includes a water supply tube **42** and a water supply connection portion **41**. The water supply tube **42** communicates with the other end side of the joining recessed portion **134** via the water supply connection portion **41**. Further, the water supply tube **42** penetrates the insertion portion **14** in the longitudinal direction, and is provided so as to straddle the bending section **12** and the distal end portion **13**. That is, one end of the water supply tube **42** is connected to the water supply connection portion **41**, and the other end of the water supply tube **42** is connected to the air supply/water supply device through the operation unit **20** and the connector unit **24**.

(29) FIG. **4** is an enlarged view illustrating a portion of the joining recessed portion **134** in FIG. **3** in an enlarged manner, FIG. **5** is a cross-sectional view taken along line V-V of FIG. **4**, FIG. **6** is a cross-sectional view taken along line VI-VI of FIG. **4**, and FIG. **7** is an explanatory view for describing a communication state between the joining recessed portion **134** and an air supply connection portion **31**. FIG. **7** illustrates outlines of the joining recessed portion **134** and the air supply connection portion **31**.

(30) The air supply connection portion **31** has a substantially cylindrical shape and sends air flowing through the air supply tube **32** to the joining recessed portion **134**. The air supply connection portion **31** has a diameter equal to the inner diameter of the air supply tube **32**, and an upstream end thereof is connected to the air supply tube **32**. Further, in the air supply connection portion **31**, a gas guide wall **33** for guiding the air into the joining recessed portion **134** is formed at a downstream end. The gas guide wall **33** is formed so as to be orthogonal to the axial length direction of the air supply connection portion **31**.

(31) A first communication hole **34** is formed in a communication portion between the air supply connection portion **31** and the joining recessed portion **134**. In the first communication hole **34**, a dimension L1 in the axial length direction of the air supply connection portion **31** is longer than a dimension L2 in a direction intersecting the axial length direction of the air supply connection portion **31**.

(32) That is, the first communication hole **34** includes an orthogonal opening portion **341** (see FIGS. **5** and **7**) opening in a direction orthogonal to the axial length direction of the air supply connection portion **31** and a parallel opening portion **342** (see FIGS. **6** and **7**) opening in a direction parallel to the axial length direction of the air supply connection portion **31**. The orthogonal opening portion **341** is wider than parallel opening portion **342**. That is, as described above, since the dimension L1 of the first communication hole **34** is longer than the dimension L2, the orthogonal opening portion **341** is wider than the parallel opening portion **342**. The orthogonal opening portion **341** is a region that looks substantially rectangular in FIG. **5**, and the parallel opening portion **342** is a region that looks a substantially convex lens in FIG. **6** (see the thick line in FIG. **6**).

(33) The water supply connection portion **41** has a substantially cylindrical shape and sends water flowing through the water supply tube **42** to the joining recessed portion **134**. The water supply connection portion **41** has a diameter equal to the inner diameter of the water supply tube **42**, and an upstream end thereof is connected to the water supply tube **42**. In the water supply connection portion **41**, a liquid guide wall **43** for guiding the water from the water supply tube **42** into the joining recessed portion **134** is formed at a downstream end. The liquid guide wall **43** is formed so as to be orthogonal to the axial length direction of the water supply connection portion **41**.

(34) A second communication hole **44** is formed in a communication portion between the water supply connection portion **41** and the joining recessed portion **134**. That is, similarly to the first communication hole **34**, the second communication hole **44** includes an orthogonal opening portion (not illustrated) opening in a direction orthogonal to the axial length direction of the water supply

connection portion **41** and a parallel opening portion **442** (see FIG. **6**) opening in a direction parallel to the axial length direction of the water supply connection portion **41**. Similarly to the first communication hole **34**, the orthogonal opening portion of the second communication hole **44** is a substantially rectangular region, and the parallel opening portion **442** is a substantially convex lens-shaped region (see the thick line in FIG. **6**).

(35) In the second communication hole **44**, a dimension L3 in the axial length direction of the water supply connection portion **41** is longer than a dimension L4 in a direction intersecting the axial length direction of the water supply connection portion **41**. Meanwhile, the dimension of the water supply connection portion **41** in the axial length direction is shorter than the dimension of the air supply connection portion **31** in the axial length direction (see FIG. **4**).

(36) That is, the dimension L3 of the second communication hole **44** is shorter than the dimension L1 of the first communication hole **34** (see FIG. **4**), and the dimension L4 of the second communication hole **44** is substantially equal to the dimension L2 of the first communication hole **34** (see FIGS. **4** and **6**).

(37) The air sent from the bend preventing portion **16** side via the air supply tube **32** flows into the joining recessed portion **134** via the air supply connection portion **31**, and the water sent via the water supply tube **42** flows into the joining recessed portion **134** via the water supply connection portion **41**. Thereafter, the air and the water flow into the air supply/water supply nozzle **140** and are emitted toward the observation optical system **132** via the outlet **141**.

(38) Meanwhile, in a case of an air supply operation of injecting only the air through the outlet **141**, a difference occurs between an air pressure in the vicinity of the first communication hole **34** and an air pressure in the water supply connection portion **41**. That is, in the case of injecting only the air through the outlet **141**, there is a difference between the air pressure at P1 position near the first communication hole **34** and on the other end side of the joining recessed portion **134** and the air pressure at P2 position near a residual water surface in the water supply connection portion **41**. Such a difference in the air pressure leads to a result of sucking up residual water in the water supply connection portion **41** from the water supply connection portion **41**, which causes a problem that some water is injected together with the air unlike the user's original intention.

(39) To cope with the problem, in the endoscope **10** according to the first embodiment, the dimension L4 of the second communication hole **44** is substantially equal to the dimension L2 of the first communication hole **34**, but the dimension L3 of the second communication hole **44** is shorter than the dimension L1 of the first communication hole **34**, as described above. That is, the size of the first communication hole **34** is larger than the size of the second communication hole **44**.

(40) Therefore, as compared with a case where the first communication hole **34** and the second communication hole **44** are equal in size, an increase in flow velocity of the air in the vicinity of the first communication hole **34** can be suppressed, and the flow of the air becomes smooth, so that generation of a vortex in the vicinity of the first communication hole **34** can be suppressed. Therefore, it is possible to suppress a decrease in the air pressure in the vicinity of the first communication hole **34**, that is, at the P1 position.

(41) FIG. **8** is simulation results illustrating flow of air in a case where sizes of the first communication hole **34** and the second communication hole **44** are the same and in a case where the size of the first communication hole **34** is larger than the size of the second communication hole **44**. That is, FIG. **8**A illustrates a conventional endoscope, and FIG. **8**B illustrates the endoscope **10** according to the first embodiment.

(42) Note that, in FIG. **8**, a direction of an arrow indicates a flow direction of air, a length of the arrow indicates a speed of the air, and brightness and darkness also indicate a speed of the air.

(43) As can be seen from FIG. **8**, the length of the arrow at the P1 position (the o portion in FIG. **8**) is shorter in FIG. **8**B than in FIG. **8**A. That is, the speed of the air at the P1 position is suppressed in FIG. **8**B as compared with FIG. **8**A.

(44) As described above, the endoscope **10** according to the first embodiment can suppress the

speed of the air at the P1 position on the other end side of the joining recessed portion **134**, and can suppress the generation of the difference between the air pressure at the P1 position and the air pressure at the P2 position in the vicinity of the residual water surface in the water supply connection portion **41**. Therefore, in the case of the air supply operation of injecting only the air through the outlet **141**, it is possible to prevent in advance the problem that some water is injected together with air.

(45) Furthermore, in the endoscope **10** according to the first embodiment, the first communication hole **34** has the dimension L1 longer than the dimension L2, and the orthogonal opening portion **341** is wider than the parallel opening portion **342**, as described above. Therefore, a ratio of the air flowing into the joining recessed portion **134** through the orthogonal opening portion **341** is larger than a ratio of the air flowing into the joining recessed portion **134** through the parallel opening portion **342**.

(46) Therefore, in FIG. **8**B, the high-speed portion in the air flow, that is, the portion with high concentration is shifted away from the second communication hole **44** than in FIG. **8**A.

(47) That is, the endoscope **10** according to the first embodiment shifts the portion where the air flow is at a high speed away from the second communication hole **44**, thereby providing a synergistic effect in suppressing the decrease in the air pressure at the P1 position.

Second Embodiment

(48) FIG. **9** is an enlarged view illustrating a portion of a joining recessed portion **134** in an enlarged manner of an endoscope **10** according to a second embodiment.

(49) An air supply connection portion **31** has a substantially cylindrical shape, and an upstream end thereof is connected to an air supply tube **32**. Further, in the air supply connection portion **31**, a gas guide wall **33**A for guiding air into a joining recessed portion **134** is formed at a downstream end. The gas guide wall **33**A is obliquely formed with respect to an axial length direction of the air supply connection portion **31**, and a dimension in a radial direction of the air supply connection portion **31** decreases toward the downstream side of the air supply connection portion **31**.

(50) A first communication hole **34** is formed in a communication portion between the air supply connection portion **31** and the joining recessed portion **134**. Similarly to the first embodiment, the first communication hole **34** includes an orthogonal opening portion **341** (see FIGS. **5** and **7**) opening in a direction orthogonal to the axial length direction of the air supply connection portion **31** and a parallel opening portion **342** (see FIGS. **6** and **7**) opening in a direction parallel to the axial length direction of the air supply connection portion **31**, and the orthogonal opening portion **341** is wider than the parallel opening portion **342**.

(51) A water supply connection portion **41** has a substantially cylindrical shape, and an upstream end thereof is connected to a water supply tube **42**. Further, in the water supply connection portion **41**, a liquid guide wall **43** for guiding water to the joining recessed portion **134** is formed at a downstream end. The liquid guide wall **43** is formed so as to be orthogonal to the axial length direction of the water supply connection portion **41**.

(52) A second communication hole **44** is formed in a communication portion between the water supply connection portion **41** and the joining recessed portion **134**. Similarly to the first embodiment, the second communication hole **44** includes an orthogonal opening portion (not illustrated) opening in a direction orthogonal to the axial length direction of the water supply connection portion **41** and a parallel opening portion **442** (see FIG. **6**) opening in a direction parallel to the axial length direction of the water supply connection portion **41**.

(53) As described above, in the endoscope **10** according to the second embodiment, the gas guide wall **33** A that guides the air from the air supply tube **32** into the joining recessed portion **134** is obliquely formed with respect to the axial length direction of the air supply connection portion **31**, and the liquid guide wall **43** is formed so as to be orthogonal to the axial length direction of the water supply connection portion **41**.

(54) Therefore, the air smoothly flows in the vicinity of the first communication hole **34** without

rapidly changing its direction. Therefore, generation of a vortex can be suppressed, and a high-speed portion of air flow in the vicinity of the first communication hole **34** can be shifted to the vicinity of the first communication hole **34** further away from the second communication hole **44**. As a result, since the flow of air is reduced at P1 position (see FIG. **4**), it is possible to suppress generation of a difference in air pressure between the P1 position and P2 position, and it is possible to prevent in advance a problem that some water is injected together with air in a case of an air supply operation.

(55) Furthermore, in the second embodiment, a distance between the gas guide wall **33**A and the liquid guide wall **43** (see the solid arrow in FIG. **9**) is longer than a distance between the gas guide wall **33**A and the liquid guide wall **43** (see the broken arrow in FIG. **9**) in a case where the gas guide wall **33**A is provided to be orthogonal to the axial length direction of the air supply connection portion **31**. Therefore, the high-speed portion of the flow of air is distant from the water supply connection portion **41** in the vicinity of the first communication hole **34**, and residual water in the water supply connection portion **41** is less easily affected by the above-described difference in air pressure.

(56) Portions similar to those in the first embodiment are denoted by the same reference numerals, and detailed descriptions thereof are omitted.

Third Embodiment

(57) FIG. **10** is an enlarged view illustrating a portion of a joining recessed portion **134** in an enlarged manner of an endoscope **10** according to a third embodiment.

(58) An air supply connection portion **31** has a substantially cylindrical shape, and an upstream end thereof is connected to an air supply tube **32**. Further, in the air supply connection portion **31**, a gas guide wall **33**A for guiding air into a joining recessed portion **134** is formed at a downstream end. The gas guide wall **33**A is obliquely formed with respect to an axial length direction of the air supply connection portion **31**.

(59) A first communication hole **34** is formed in a communication portion between the air supply connection portion **31** and the joining recessed portion **134**. The shape of the first communication hole **34** is similar to that of the first embodiment, and a detailed description thereof will be omitted.

(60) A water supply connection portion **41** has a substantially cylindrical shape, and an upstream end thereof is connected to a water supply tube **42**. Further, in the water supply connection portion **41**, a liquid guide wall **43** for guiding water to the joining recessed portion **134** is formed at a downstream end. The liquid guide wall **43** is formed so as to be orthogonal to the axial length direction of the water supply connection portion **41**.

(61) Furthermore, in the water supply connection portion **41**, a diameter-reduced portion **41**A with a diameter gradually reduced toward a downstream side is formed in an intermediate part in the axial length direction, and an upstream side of the diameter-reduced portion **41**A is larger in diameter than a downstream side of the diameter-reduced portion **41**A.

(62) A second communication hole **44** is formed in a communication portion between the water supply connection portion **41** and the joining recessed portion **134**. The shape of the second communication hole **44** is similar to that of the first embodiment, and a detailed description thereof will be omitted.

(63) As described above, in the endoscope **10** according to the third embodiment, the diameter-reduced portion **41**A is formed in the water supply connection portion **41**, and the diameter on the downstream side of the diameter-reduced portion **41**A is smaller than the diameter on the upstream side. That is, since the diameter on the downstream side of the water supply connection portion **41** is small, surface tension of residual water in the water supply connection portion **41** increases, and the residual water in the water supply connection portion **41** is less easily affected by a difference in air pressure generated between P1 position and P2 position (see FIG. **4**). Therefore, even in the case where the difference in air pressure is generated between the P1 position and the P2 position, suction of the residual water in the water supply connection portion **41** is suppressed.

(64) In the above description, the case where the liquid guide wall **43** is formed to be orthogonal to the axial length direction of the water supply connection portion **41** has been described as an example, but the embodiment is not limited thereto. For example, the liquid guide wall **43** may be obliquely formed with respect to the axial length direction of the water supply connection portion **41**, similarly to the gas guide wall **33**A.
(65) Portions similar to those in the first embodiment are denoted by the same reference numerals, and detailed descriptions thereof are omitted.
(66) Technical features (constitutional requirements) that have been described in the first to third embodiments can be combined with one another, and a new technical feature can be formed with the combination.
(67) The embodiments that have been disclosed herein should be considered to be illustrative and not restrictive in all respects. The scope of the present invention is indicated by the scope of claims, not the above-described meaning, and is intended to include all modifications within the meaning and scope equivalent to the claims.
REFERENCE SIGNS LIST
(68) **10** Endoscope **13** Distal end portion **14** Insertion portion **30** Gas path **31** Air supply connection portion **33** Gas guide wall **34** First communication hole **40** Liquid path **41** Water supply connection portion **41**A Diameter-reduced portion **43** Liquid guide wall **44** Second communication hole **134** Joining recessed portion **140** Air supply/water supply nozzle

Claims

1. An endoscope comprising; a liquid path extending along a liquid path axis and through which a liquid passes; a gas path extending along a gas path axis and through which a gas passes, the liquid path axis and the gas path axis extending parallel to and being different from each other; a joining recessed portion extending along a joining axis and in which the liquid and the gas join formed in a distal end portion of the endoscope, the joining axis, the liquid path axis and the gas path axis extending parallel to and being different from each other; and a gas guide wall obliquely formed with respect to an axial length direction of the gas path, wherein one end side of the liquid path and one end side of the gas path communicate with the joining recessed portion, a first communication hole is formed at an intersection between the gas path and the joining recessed portion, and a second communication hole is formed at an intersection between the liquid path and the joining recessed portion, a size of the first communication hole is larger than a size of the second communication hole, and the gas guide wall is formed on the one end side of the gas path and guides the gas to the first communication hole.
2. The endoscope according to claim 1, wherein a dimension in an axial length direction of the gas path is longer than a dimension in a direction intersecting the axial length direction of the gas path in the first communication hole.
3. The endoscope according to claim 1, wherein a liquid guide wall that guides the liquid to the second communication hole is formed on the one end side of the liquid path, and the liquid guide wall is perpendicularly formed with respect to an axial length direction of the liquid path.
4. An endoscope comprising; a liquid path extending along a liquid path axis and through which a liquid passes; a gas path extending along a gas path axis and through which a gas passes, the liquid path axis and the gas path axis extending parallel to and being different from each other; a joining recessed portion extending along a joining axis and in which the liquid and the gas join formed in a distal end portion of the endoscope, the joining axis, the liquid path axis and the gas path axis extending parallel to and being different from each other, wherein one end side of the liquid path and one end side of the gas path communicate with the joining recessed portion, a first communication hole is formed at an intersection between the gas path and the joining recessed portion, and a second communication hole is formed at an intersection between the liquid path and

the joining recessed portion, a size of the first communication hole is larger than a size of the second communication hole, and the liquid path has a cylindrical shape, and further includes a diameter-reduced portion on the one end side.

5. The endoscope according to claim 4, wherein a dimension in an axial length direction of the gas path is longer than a dimension in a direction intersecting the axial length direction of the gas path in the first communication hole.

6. The endoscope according to claim 4, wherein a gas guide wall that guides the gas to the first communication hole is formed on the one end side of the gas path, and the gas guide wall is obliquely formed with respect to an axial length direction of the gas path.

7. The endoscope according to claim 4, wherein a liquid guide wall that guides the liquid to the second communication hole is formed on the one end side of the liquid path, and the liquid guide wall is perpendicularly formed with respect to an axial length direction of the liquid path.