CLAIMS

1. A foreign matter removal unit comprising:

a rectangular optical member disposed on an optical path, in which is set an optically effective region through which a light flux passes;

a piezoelectric device provided to a side of said optical member on the outer side of said optically effective region; and

a vibration suppression member provided to a side of said optical member where said piezoelectric device is not provided,

wherein said vibration suppression member is provided to said optical member such that an edge face of the side of said optical member where said vibration suppression member is provided does not protrude out from an edge face of said vibration suppression member.

2. The foreign matter removal unit according to Claim 1,

wherein said vibration suppression member has a strip-shape of which the length of the long side is longer than the long side of said optically effective region, and

wherein said vibration suppression member is provided to said optical member such that the long side of said optically effective region is within the range of the long

side of said vibration suppression member.

3. The foreign matter removal unit according to Claim 1, further comprising:

a retaining member configured to retain said optical member,

wherein said retaining member holds said optical member so as to not come into contact with said vibration suppression member.

4. The foreign matter removal unit according to Claim 3, further comprising:

a sealing member configured to seal off said optically effective region, being sandwiched between said optical member and said retaining member,

wherein said vibration suppression member is provided to said optical member so as to be further outwards than said sealing member.

5. The foreign matter removal unit according to Claim 1,

wherein said vibration suppression member has a rectangular shape in which an opening greater than said optically effective region is formed, and

wherein said vibration suppression member is provided to said optical member such that said optically effective

region is situated within said opening.

6. The foreign matter removal unit according to Claim 5, further comprising:

a retaining member configured to retain said optical member,

wherein said retaining member holds said optical member, such that said vibration suppression member and said retaining member do not come into contact in the vicinity of the side of said optical member where said vibration suppression member is provided.

7. The foreign matter removal unit according to Claim 6,

wherein said sealing member seals off said optically effective region, by said vibration suppression member being sandwiched between said optical member and said retaining member.

8. The foreign matter removal unit according to Claim 1,

wherein said vibration suppression member is applied to said optical member such that the edge face of said vibration suppression member protrudes from the edge face of said optical member, and

wherein an adhesive face is also formed on a region of said vibration suppression member protruding from the edge

face of said optical member.

9. The foreign matter removal unit according to Claim 1,

wherein said piezoelectric device generates by excitation a first flexure vibration and a second flexure vibration at the same time, and

wherein said second flexure vibration differs in time phase from said first flexure vibration, and also the order of flexure vibration differs by one from said first flexure vibration.

10. The foreign matter removal unit according to Claim 1,

wherein said piezoelectric device generates by excitation a first flexure vibration in a direction orthogonal to the side of said optical member to which said piezoelectric device is provided, such that a first standing wave is generated,

wherein said piezoelectric device generates by excitation a second flexure vibration in a direction orthogonal to the side of said optical member to which said piezoelectric device is provided, such that a second standing wave is generated, and

wherein the order of said second flexure vibration differs by one from said first flexure vibration.

11. An optical apparatus comprising:

a rectangular optical member disposed on an optical path, in which is set an optically effective region through which a light flux passes;

a piezoelectric device provided to a side of said optical member on the outer side of said optically effective region; and

a vibration suppression member provided to a side of said optical member where said piezoelectric device is not provided,

wherein said vibration suppression member is provided to said optical member such that an edge face of the side of said optical member where said vibration suppression member is provided does not protrude out from an edge face of said vibration suppression member.

12. The optical apparatus according to Claim 11,

wherein said vibration suppression member has a strip-shape of which the length of the long side is longer than the long side of said optically effective region, and

wherein said vibration suppression member is provided to said optical member such that the long side of said optically effective region is within the range of the long side of said vibration suppression member.

13. The optical apparatus according to Claim 11, further comprising:

a retaining member configured to retain said optical member,

wherein said retaining member holds said optical member so as to not come into contact with said vibration suppression member.

14. The optical apparatus according to Claim 13, further comprising:

a sealing member configured to seal off said optically effective region, being sandwiched between said optical member and said retaining member,

wherein said vibration suppression member is provided to said optical member so as to be further outwards than said sealing member.

15. The optical apparatus according to Claim 11,

wherein said vibration suppression member has a rectangular shape in which an opening greater than said optically effective region is formed, and

wherein said vibration suppression member is provided to said optical member such that said optically effective region is situated within said opening.

16. The optical apparatus according to Claim 15, further comprising:

a retaining member configured to retain said optical member,

wherein said retaining member holds said optical member, such that said vibration suppression member and said retaining member do not come into contact in the vicinity of the side of said optical member where said vibration suppression member is provided.

17. The optical apparatus according to Claim 16,

wherein said sealing member seals off said optically effective region, by said vibration suppression member being sandwiched between said optical member and said retaining member.

18. The optical apparatus according to Claim 11,

wherein said vibration suppression member is applied to said optical member such that the edge face of said vibration suppression member protrudes from the edge face of said optical member, and

wherein an adhesive face is also formed on a region of said vibration suppression member protruding from the edge face of said optical member.

19. The optical apparatus according to Claim 11,

wherein said piezoelectric device generates by excitation a first flexure vibration and a second flexure vibration at the same time, and

wherein said second flexure vibration differs in time phase from said first flexure vibration, and also the order of flexure vibration differs by one from said first flexure vibration.

20. The optical apparatus according to Claim 11,

wherein said piezoelectric device generates by excitation a first flexure vibration in a direction orthogonal to the side of said optical member to which said piezoelectric device is provided, such that a first standing wave is generated,

wherein said piezoelectric device generates by excitation a second flexure vibration in a direction orthogonal to the side of said optical member to which said piezoelectric device is provided, such that a second standing wave is generated, and

wherein the order of said second flexure vibration differs by one from said first flexure vibration.

CLAIMS

1. A foreign substance removal unit comprising:

a rectangular optical member disposed on an optical path, in which is set an optically effective region through which a light flux passes;

a piezoelectric device applied to a side of the optical member on the outer side of the optically effective region;

a vibration suppression member applied to a side of the optical member where the piezoelectric device is not applied; and

a retaining member arranged to retain the optical member,

wherein the vibration suppression member is applied to the optical member such that an edge face of the side of the vibration suppression member protrudes outwardly from the edge face of the optical member, and

wherein the retaining member retains the optical member such that the retaining member does not contact the edge face of the vibration suppression member that is protruding outwardly from the edge face of the optical member.

2. The foreign substance removal unit according to Claim 1,

wherein the vibration suppression member has a strip-shape of which the length of the long side is longer than the long side of the optically effective region, and

wherein the vibration suppression member is applied to the optical member such that the long side of the optically effective region is within the range of the long side of the vibration suppression member.

3. The foreign substance removal unit according to Claim 1,

further comprising:

a sealing member configured to seal off the optically effective region, being sandwiched between the optical member and the retaining member,

wherein the vibration suppression member is applied to the optical member so as to be further outwards than the sealing member.

4. The foreign substance matter removal unit according to Claim 1,

wherein the vibration suppression member has a rectangular shape in which an opening greater than the optically effective region is formed, and

wherein the vibration suppression member is applied to the optical member such that the optically effective region is situated within the opening.

5. The foreign matter removal unit according to Claim 5,

wherein the retaining member holds the optical member, such that the edge face of the vibration suppression member and the retaining member do not come into contact.

6. The foreign substance removal unit according to Claim 6,

wherein the vibration suppression member is sandwiched between the optical member and the retaining member, such that the vibration suppression member and the retaining member do not come into contact in the vicinity of the side of the optical member where the vibration suppression member is applied.

7. The foreign substance matter removal unit according to Claim 1,

wherein an adhesive face is formed on a region of the vibration suppression member protruding from the edge face of the optical member.

8. The foreign substance removal unit according to Claim 1,

wherein the piezoelectric device generates by excitation a first flexure vibration and a second flexure vibration at the same time, and

wherein the second flexure vibration differs in time phase from the first flexure vibration, and also the order of flexure vibration differs by one from the first flexure vibration.

9. The foreign substance matter removal unit according to Claim 1,

wherein the piezoelectric device generates by excitation a first flexure vibration in a direction orthogonal to the side of the optical member to which the piezoelectric device is applied, such that a first standing wave is generated,

wherein the piezoelectric device generates by excitation a second flexure vibration in a direction orthogonal to the side of the optical member to which the piezoelectric device is applied, such that a second standing wave is generated, and

wherein the order of the second flexure vibration differs by one from the first flexure vibration.

10. An optical apparatus comprising:

a rectangular optical member disposed on an optical path, in which is set an optically effective region through which a light flux passes;

a piezoelectric device applied to a side of the optical member on the outer side of the optically effective region;

a vibration suppression member applied to a side of the optical member where the piezoelectric device is not applied; and

a retaining member arranged to retain the optical member,

wherein the vibration suppression member is applied to the optical member such that an edge face of the vibration suppression member protrudes outwardly from the edge face of the optical member, and

wherein the retaining member retains the optical member such that the retaining member does not contact the edge face of the vibration suppression member that is protruding outwardly from the edge face of the optical member.

11. The optical apparatus according to Claim 11,

wherein the vibration suppression member has a strip-shape of which the length of the long side is longer than the long side of the optically effective region, and

wherein the vibration suppression member is applied to the optical member such that the long side of said optically effective region is within the range of the long side of the vibration suppression member.

12. The optical apparatus according to Claim 11, further comprising:

a sealing member configured to seal off the optically effective region, being sandwiched between the optical member and said retaining member,

wherein said vibration suppression member is applied to the optical member so as to be further outwards than the sealing member.

13. The optical apparatus according to Claim 11,

wherein the vibration suppression member has a rectangular shape in which an opening greater than the optically effective region is formed, and

wherein the vibration suppression member is provided to said optical member such that said optically effective region is situated within the opening.

14. The optical apparatus according to Claim 15,

wherein the retaining member holds the optical member, such that the edge face of the vibration suppression member and the retaining member do not come into contact.

15. The optical apparatus according to Claim 16,

wherein the vibration suppression member is sandwiched between the optical member and the retaining member, such that the vibration suppression member and the retaining member do not come into contact in the vicinity of the side of the optical member where the vibration suppression member is applied.

16. The optical apparatus according to Claim 11,

wherein an adhesive face is also formed on a region of the vibration suppression member protruding from the edge face of the optical member.

17. The optical apparatus according to Claim 11,

wherein the piezoelectric device generates by excitation a first flexure vibration and a second flexure vibration at the same time, and

wherein the second flexure vibration differs in time phase from the first flexure vibration, and the order of flexure vibration differs by one from the first flexure vibration.

18. The optical apparatus according to Claim 11,

wherein the piezoelectric device generates by excitation a first flexure vibration in a direction orthogonal to the side of the optical member to which the piezoelectric device is applied, such that a first standing wave is generated,

wherein the piezoelectric device generates by excitation a second flexure vibration in a direction orthogonal to the side of the optical member to which the piezoelectric device is applied, such that a second standing wave is generated, and

wherein the order of the second flexure vibration differs by one from the first flexure vibration.