CLAIMS

[Claim 1]

A vibrating device comprising:

a base portion; and

a number 2N of tuning fork arms joined to one end of the base portion and extending in a Y-direction, N being an integer equal to 2 or larger,

wherein the number 2N of tuning fork arms are arranged side by side in an X-direction that is perpendicular to the Y-direction, each of the tuning fork arms causing flexural vibration in a Z-direction that is perpendicular to the X-direction and the Y-direction, and

phases of the flexural vibrations of the number N of tuning fork arms positioned at one side of an imaginary line, which passes a center of a region in the X-direction where the number 2N of tuning fork arms are disposed, and which extends in the Y-direction, are symmetric to phases of the flexural vibrations of the number N of tuning fork arms positioned at the other side of the imaginary line.

[Claim 2]

The vibrating device according to Claim 1, wherein the number N is two, and the two tuning fork arms positioned at inner side in the X-direction and the two tuning fork arms positioned at outer side in the X-direction cause the flexural vibrations in opposite phases.

[Claim 3]

The vibrating device according to Claim 1 or 2, wherein each of the tuning fork arms includes a Si layer made of a degenerate semiconductor, a silicon oxide layer, a piezoelectric layer, and first and second electrodes through which a voltage is applied to the piezoelectric layer.

[Claim 4]

The vibrating device according to Claim 3, wherein the Si layer is doped with an n-type dopant.

[Claim 5]

The vibrating device according to Claim 4, wherein the dopant is phosphorus (P).

[Claim 6]

The vibrating device according to any one of Claims 1 to 5, wherein a width of an end portion of each tuning fork arm at side opposite to an end portion thereof joined to the base portion is larger than a width of the end portion joined to the base portion.

[Claim 7]

The vibrating device according to Claim 6, wherein a mass adding portion is provided at the end portion of each tuning fork arm at the side opposite to the end portion thereof joined to the base portion, the mass adding portion having a larger width than a remaining portion.

CLAIMS

[Claim 1]
A vibrating device comprising:
a base portion; and
a number 2N of tuning fork arms joined to one end of the base portion and extending in a Y-direction, N being an integer equal to 2 or larger,
wherein the number 2N of tuning fork arms are arranged side by side in an X-direction that is perpendicular to the Y-direction, each of the tuning fork arms causing flexural vibration in a Z-direction that is perpendicular to the X-direction and the Y-direction, and
phases of the flexural vibrations of the number N of tuning fork arms positioned at one side of an imaginary line, which passes a center of a region in the X-direction where the number 2N of tuning fork arms are disposed, and which extends in the Y-direction, are symmetric to phases of the flexural vibrations of the number N of tuning fork arms positioned at the other side of the imaginary line.
Wherein the number N is two, and the two tuning fork arms positioned at inner side in the X-direction and the two tuning fork arms positioned at outer side in the X-direction cause the flexural vibrations in opposite phases,
Wherein each of the tuning fork arms includes a Si layer made of a degenerate semiconductor, a silicon oxide layer, a piezoelectric layer, and first and second electrodes through which a voltage is applied to the piezoelectric layer, and
When the thickness of the silicon oxide layer being T2 and the thickness of the Si layer being T1, the thickness ratio T2/(T1+T2) being within a range of $(-0.0002X2-0.0136x + 0.0014) \pm 0.005$.

[Claim 2]
The vibrating device according to Claim 1, wherein the Si layer is doped with an n-type dopant.

[Claim 3]
The vibrating device according to Claim 2, wherein the dopant is phosphorus (P).

[Claim 4]
The vibrating device according to any one of Claims 1 to 3, wherein a width of an end portion of each tuning fork arm at side opposite to an end portion thereof joined to the base portion is larger than a width of the end portion joined to the base portion.

[Claim 5]

The vibrating device according to Claim 4, wherein a mass adding portion is provided at the end portion of each tuning fork arm at the side opposite to the end portion thereof joined to the base portion, the mass adding portion having a larger width than a remaining portion.