What is claimed is:

1. A bulk acoustic wave resonator, comprising a substrate, and a lower conductive layer, a piezoelectric layer and an upper conductive layer, which are sequentially disposed on the substrate in a stacked manner, wherein the lower conductive layer, the piezoelectric layer and the upper conductive layer have an overlapping region in a stacking direction, a first cavity located between the upper conductive layer and the piezoelectric layer is disposed outside the overlapping region, a plurality of first support columns are disposed in the first cavity, the plurality of first support columns are supported between the piezoelectric layer and the upper conductive layer, the plurality of first support columns divide the first cavity into a plurality of through holes, and the plurality of through holes are distributed in a direction from a center of the overlapping region to a boundary of the overlapping region;

the upper conductive layer comprises an upper electrode located in the overlapping region, and an upper electrode lead-out portion located outside the overlapping region, a periphery of the upper electrode is composed of a first edge and a second edge, the upper electrode is connected with the upper electrode lead-out portion by the first edge, a third cavity is disposed between the upper electrode and the piezoelectric layer, the third cavity is located on the second edge, and the first cavity is located on the first edge;

a plurality of third cavities are disposed between the upper electrode and the piezoelectric layer, and the plurality of third cavities are distributed at intervals along the second edge;

a second cavity is disposed between the substrate and the lower conductive layer, an orthographic projection of the third cavity in the stacking direction does not overlap with an orthographic projection of the second cavity in the stacking direction;

a fourth cavity located outside the overlapping region is disposed in the lower conductive layer, the fourth cavity penetrates through the lower conductive layer;

the second cavity, the third cavity and the fourth cavity are distributed in the direction from the center of the overlapping region to the boundary of the overlapping region.

2. The bulk acoustic wave resonator according to claim 1, wherein orthographic projections of

a part of through holes close to the center of the overlapping region among the plurality of through holes in the stacking direction are located in the second cavity; and/or, orthographic projections of a part of through holes away from the center of the overlapping region among the plurality of through holes in the stacking direction do not overlap with an orthographic projection of the second cavity in the stacking direction.

3. The bulk acoustic wave resonator according to claim 1, wherein a spacing between two adjacent first support columns is a first spacing, and at least part of the first spacings are different from each other.

4. The bulk acoustic wave resonator according to claim 1, wherein a plurality of the first cavities are disposed outside the overlapping region, and the plurality of the first cavities are distributed at intervals along a periphery of the overlapping region.

5. The bulk acoustic wave resonator according to claim 4, wherein among the plurality of first cavities, a number of through holes contained in at least two first cavities is different.

6. The bulk acoustic wave resonator according to claim 1, wherein the upper conductive layer is provided with an anchoring portion, the anchoring portion is located above the first cavity, and a surface of a side of the anchoring portion that faces away from the piezoelectric layer is an undulating surface.

7. The bulk acoustic wave resonator according to claim 1, wherein a side of the third cavity that faces away from the center of the overlapping region is closed by a second support column supported between the upper electrode and the piezoelectric layer.

8. The bulk acoustic wave resonator according to claim 1, wherein a plurality of third support columns supported between the piezoelectric layer and the substrate are disposed in the fourth cavity, the plurality of third support columns divide the fourth cavity into a plurality of compartments, and the plurality of compartments are distributed in the direction from the center of the overlapping region to the boundary of the overlapping region.

9. The bulk acoustic wave resonator according to claim 1, wherein when the second cavity is disposed between the substrate and the lower conductive layer, an orthographic projection of the fourth cavity in the stacking direction does not overlap with an orthographic projection of the second cavity in the stacking direction.

10. The bulk acoustic wave resonator according to claim 8, wherein a spacing between two adjacent third support columns is a second spacing, and at least part of the second spacings are different from each other.

11. A bulk acoustic wave resonator manufacturing method, comprising:

forming a lower conductive layer and a piezoelectric layer on a substrate;

forming, on the piezoelectric layer, a plurality of first sacrificial portions, an upper conductive layer covering the plurality of first sacrificial portions, and first support columns filled between two adjacent first sacrificial portions, wherein the lower conductive layer, the piezoelectric layer and the upper conductive layer have an overlapping region in a stacking direction, the plurality of first sacrificial portions are located outside the overlapping region, and the plurality of first sacrificial portions are distributed at intervals in a direction from a center of the overlapping region to a boundary of the overlapping region; and

releasing the plurality of first sacrificial portions to form a first cavity between the upper conductive layer and the piezoelectric layer, wherein the first cavity is divided by the plurality of first support columns into a plurality of through holes which are distributed in the direction from the center of the overlapping region to the boundary of the overlapping region;

wherein forming, on the piezoelectric layer, the plurality of first sacrificial portions, the upper conductive layer covering the plurality of first sacrificial portions, and the plurality of first support columns filled between two adjacent first sacrificial portions, comprises:

forming a first sacrificial layer on the piezoelectric layer;

etching the first sacrificial layer to form the plurality of first sacrificial portions and a second sacrificial portion; and

forming, on the piezoelectric layer, the upper conductive layer covering the plurality of first sacrificial portions and the second sacrificial portion, and the plurality of first support columns filled between two adjacent first sacrificial portions, wherein the second sacrificial portion is released to form a third cavity located between the upper conductive layer and the piezoelectric layer, the upper conductive layer comprises an upper electrode located in the overlapping region, and an upper electrode lead-out portion located outside the overlapping region, a periphery of the upper electrode is composed of a first edge and a second edge, the upper electrode is connected with the upper electrode lead-out portion by the first edge, a third cavity is located on the second edge, and the first cavity is located on the first edge;

before forming the lower conductive layer on the substrate, the method further comprises: etching the substrate to form a second cavity; and filling the second cavity with a fourth sacrificial portion, so that an upper surface of the substrate is flush;

forming the lower conductive layer and the piezoelectric layer on the substrate comprises:

forming the lower conductive layer on the substrate;

etching the lower conductive layer to form a fourth cavity penetrating through the lower conductive layer in the lower conductive layer;

the second cavity, the third cavity and the fourth cavity are distributed in the direction from the center of the overlapping region to the boundary of the overlapping region.

12. The bulk acoustic wave resonator manufacturing method according to claim 11, wherein a plurality of third support columns located in the fourth cavity, wherein the plurality of third

support columns divide the fourth cavity into a plurality of compartments, and the plurality of compartments are distributed in the direction from the center of the overlapping region to the boundary of the overlapping region;

respectively filling the plurality of compartments with third sacrificial portions, so that a surface of a side of the lower conductive layer that faces away from the substrate is flush; and

forming the piezoelectric layer on a surface of a side of the lower conductive layer that faces away from the substrate.

13. The bulk acoustic wave resonator manufacturing method according to claim 12, wherein forming the lower conductive layer on the substrate comprises: depositing a seed layer on the substrate, and forming the lower conductive layer on the seed layer.

14. The bulk acoustic wave resonator manufacturing method according to claim 11, wherein the method further comprises:

at least etching the upper conductive layer, the piezoelectric layer and the lower conductive layer to form a release hole connected to the fourth sacrificial portion, so as to release the fourth sacrificial portion via the release hole, wherein the release hole is located on an edge of the third cavity.