CLAIMS

1. An implanted tongue pulling device, implanted into a mandible and a tongue body of a human being to tighten a tongue dorsum and/or a tongue base of the human being, comprising:

a pull plate, wherein the pull plate is a flat implant capable of being implanted under a mucous membrane layer of the tongue body, and includes one or more through holes facilitating growth of fibrous tissues and pull line fixing mechanisms;

a pull line, wherein the pull line is a thread made of a material capable of being implanted into the human being for a long period of time; and

a retractor, the retractor including a control switch capable of adjusting a tension of the pull line, a pull line fixing device capable of fixing the pull line, and a casing, wherein the control switch and the pull line fixing device are mounted in the casing,

wherein the pull line has a first end connected to the pull plate and a second end connected to the retractor.

2. The tongue pulling device according to claim 1, wherein a distance between the pull plate and the retractor is reduced by 5 mm to 20 mm due to a pulling of the pull line; and a pressure generated by a force of tongue muscles on the pull plate due to the reduction of the distance between the pull plate and the retractor is between 50 g/cm^2 and 1000 g/cm^2.

3. The tongue pulling device according to claim 1, wherein there are at least three pull lines, and each of the pull lines has a first end connected to the retractor and a second end connected to a corresponding one of at least three pull line fixing mechanisms of the pull plate that are at different positions, so as to spatially position the pull plate.

4. A pull plate, implanted into a tongue body of a human being to tighten a tongue dorsum and/or a tongue base, wherein the pull plate is a flat implant capable of being implanted under a mucous membrane layer of the tongue body, and the pull plate includes one or more through holes facilitating growth of fibrous tissues and pull line fixing mechanisms, a frame, and medical films wrapped on the frame.

5. The pull plate according to claim 4, wherein the pull line fixing mechanisms include one selected from the group consisting of a plurality of through holes for winding, binding or fixing a plurality of pull lines; catch-slot or concave-convex engagement mechanisms for

fixing the plurality of pull lines; or rivet fastening mechanisms or thread fastening mechanisms capable of fixing plurality of pull lines.

6. The pull plate according to claim 4, wherein the frame of the pull plate is a mesh formed by braided elastic wires, and the elastic wires are capable of moving in a gap between the medical films.

7. The pull plate according to claim 4, wherein the pull plate has a curved surface matching with a shape of the tongue dorsum portion and/or the tongue base portion of the human being, and the curved surface has a shape selected from the group consisting of a rectangle, a square, a trapezoid, a circle, an ellipse, a V-shape, a U-shape and an H-shape.

8. The pull plate according to claim 4, wherein the pull plate further comprises a left-side pull plate and a right-side pull plate; the left-side pull plate and the right-side pull plate are assembled together through a mechanical connection mechanism; and a gap and junction are formed between the left-side pull plate and the right-side pull plate.

9. The pull plate according to claim 8, wherein the gap has a width between 2 mm and 5 mm and a length between 5 mm and 15 mm.

10. The pull plate according to claim 8, wherein the mechanical connection mechanism is a mechanical fixing mechanism capable of fixing two metal plates, and the mechanical connection mechanism is selected from a group consisting of a rivet structure, a concave-convex engagement structure, and a thread fixing structure.

11. A retractor, implanted on a mandible of a human being to fix a pull line, wherein the retractor comprises a control switch capable of adjusting a tension of the pull line, a pull line fixing device capable of fixing the pull line, and a casing, the control switch and the pull line fixing device being mounted in the casing.

12. The retractor according to claim 11, wherein the control switch of the retractor is a thread structure or concave-convex engagement structure, and a tension of the pull line is increased or reduced by adjusting the control switch.

13. The retractor according to claim 11, wherein the control switch includes a tightening switch capable of increasing a tension of the pull line and a loosening switch capable of reducing the tension of the pull line.

14. The retractor according to claim 13, wherein the control switch includes a ratchet, the ratchet is configured to rotate in a first direction when the tightening switch is pressed, and rotate in a second direction opposite the first direction when the loosening switch is pressed.

15. The retractor according to claim 11, wherein the control switch includes a positioning convex stair and a positioning concave groove, and the positioning convex stair and the positioning concave groove are engaged with each other to form a concave-convex engagement structure for positioning the retractor.

16. The retractor according to claim 13, wherein the control switch includes one or more tooth racks, when the control switch is pressed, the positioning convex stair of the control switch is capable of moving longitudinally along the tooth racks; and when the control switch released, the positioning convex stair of the control switch is automatically engaged into the positioning concave groove, and the positioning convex stair of the control switch does not move longitudinally along the tooth racks.

17. The retractor according to claim 11, wherein the retractor includes an anti-cutting buffer device, the anti-cutting buffer device is a spring structure, and the anti-cutting buffer device is disposed inside the casing and connected to the pull line fixing device; and when the tension of the pull line is greater than a preset operational driving force of the spring structure or a pressure on the pull plate is greater than a set value, the spring structure of the anti-cutting buffer device is configured to deform automatically to reduce the tension of the pull line, so as to prevent the pull plate from hurting the tongue muscles.

18. The retractor according to claim 11, wherein the retractor includes a protective sheath, the protective sheath is a hollow hose made of a flexible medical material, and the protective sheath is mounted in the casing.

19. The retractor according to claim 18, wherein the protective sheath is a multi-layer hollow hose, having an inner layer made of an ultra-smooth material, and an outer layer made of a highly biocompatible material facilitating growth of fibrous tissues.

20. The retractor according to claim 18, wherein a silica gel plug in a color similar to the skin color of the human being is disposed on the casing, the silica gel plug is connected to the casing, and after the silica gel plug is removed, the tension of the pull line is adjusted by adjusting the control switch; during sleep, the pull line is tightened to apply a tension to the

pull plate, so as to tighten the tongue dorsum portion and/or the tongue base portion toward the mandible, thereby maintaining the airway at the palatopharyngeal portion open; and in a non-sleep state, the pull line is loosened to release the pull plate from the pull line, so as to allow the tongue to move freely, thereby maintaining normal swallowing and speech functions.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An implanted tongue pulling device, implanted into a mandible and a tongue body of a human being to tighten a tongue dorsum and/or a tongue base of the human being, comprising:

a pull plate, wherein the pull plate is a flat implant capable of being implanted under a mucous membrane layer of the tongue body, and includes one or more through holes facilitating growth of fibrous tissues and pull line fixing mechanisms;

a pull line, wherein the pull line is a thread made of a material capable of being implanted into the human being; and

a retractor, the retractor including a control switch capable of adjusting a tension of the pull line, a pull line fixing device capable of fixing the pull line, and a casing, wherein the control switch and the pull line fixing device are mounted in the casing, the control switch comprising a tightening switch, a loosening switch, and a ratchet, wherein:

pressing the tightening switch causes the ratchet to rotate, thereby driving the pull line fixing device to tighten the pull line,

pressing the loosening switch causes the ratchet to be released, thereby driving the pull line fixing device to loosen the pull line, and

the pull line has a first end connected to the pull plate and a second end connected to the retractor.

2. The tongue pulling device according to claim 1, wherein a distance between the pull plate and the retractor is reduced by 5 mm to 20 mm due to a pulling of the pull line; and a pressure generated on the pull plate due to the reduction of the distance between the pull plate and the retractor is between 50 g/cm^2 and 1000 g/cm^2.

3. The tongue pulling device according to either one of claims 1 or 2, wherein there are at least three pull lines, and each of the pull lines has a respective first end connected to the retractor and a respective second end connected to a corresponding one of at least three pull line fixing mechanisms of the pull plate that are at different positions, so as to spatially position the pull plate.

4. The tongue pulling device according to any one of claims 1 to 3, wherein the pull plate includes a frame, and medical films wrapped on the frame.

5. The tongue pulling device according to claim 4, wherein the pull line fixing mechanisms include one selected from the group consisting of a plurality of through holes for winding, binding or fixing a plurality of pull lines; catch-slot or concave-convex engagement mechanisms for fixing the plurality of pull lines; or rivet fastening mechanisms or thread fastening mechanisms capable of fixing plurality of pull lines.

6. The tongue pulling device according to either one of claims 4 or 5, wherein the frame of the pull plate is a mesh formed by braided elastic wires, and the elastic wires are capable of moving in a gap between the medical films.

7. The tongue pulling device according to any one of claims 4 to 6, wherein the pull plate has a curved surface matching with a shape of the tongue dorsum portion and/or the tongue base portion of the human being, and the curved surface has a shape selected from the group consisting of a rectangle, a square, a trapezoid, a circle, an ellipse, a V-shape, a U-shape and an H-shape.

8. The tongue pulling device according to any one of claims 4 to 7, wherein the pull plate further comprises a left-side pull plate and a right-side pull plate; the left-side pull plate and the right-side pull plate are assembled together through a mechanical connection mechanism; and a gap and junction are formed between the left-side pull plate and the right-side pull plate.

9. The tongue pulling device according to claim 8, wherein the gap has a width between 2 mm and 5 mm and a length between 5 mm and 15 mm.

10. The tongue pulling device according to either one of claims 8 or 9, wherein the mechanical connection mechanism is a mechanical fixing mechanism capable of fixing two metal plates, and the mechanical connection mechanism is selected from a group consisting of a rivet structure, a concave-convex engagement structure, and a thread fixing structure.