CLAIMS

What is claimed is:

1. A vertical take-off and landing aircraft, characterized by comprising:

a fuselage, wherein both sides of the fuselage are provided with wings symmetrically, a tail of the fuselage is provided with an empennage, and ruddervators are provided at the empennage; and

2N tilting rotors, symmetrically provided at both sides of the fuselage, wherein a part of the 2N tilting rotors are provided on the empennage;

wherein N is a natural number greater than or equal to 2; in a vertical take-off and landing state, projections of propellers of the 2N tilting rotors on a horizontal plane are centrally symmetrical about point B, point B and a center of gravity point G of the vertical take-off and landing aircraft are both provided in a symmetry plane of the fuselage, and point B is provided at a side of point G close to the empennage; during transition flight of the vertical take-off and landing aircraft, both point G and point B is configured to move along the symmetry plane, and point B is always provided at the side of point G close to the empennage.

2. The vertical take-off and landing aircraft according to claim 1, wherein in a cruising state and/or a vertical take-off state and/or a transition state, a tilt speed of any tilting rotor on the empennage and a tilt speed of any tilting rotor at other positions have a first difference, and the first difference is not equal to 0.

3. The vertical take-off and landing aircraft according to claim 1, wherein in a cruising state and/or a vertical take-off state and/or a transition state, a rotation speed of any tilting rotor on the empennage and a rotation speed of any tilting rotor at other positions have a second difference, and the second difference is not equal to 0.

4. The vertical take-off and landing aircraft according to claim 1, wherein the vertical take-off and landing aircraft comprises four tilting rotors symmetrically provided at both sides of the

fuselage, wherein two of the tilting rotors are symmetrically provided on the wing about the fuselage, and another two of the tilting rotors are symmetrically provided on the empennage.

5. The vertical take-off and landing aircraft according to claim 1, wherein the vertical take-off and landing aircraft comprises six tilting rotors symmetrically provided at both sides of the fuselage, four of the tilting rotors are symmetrically provided on the wing about the fuselage, and another two of the tilting rotors are symmetrically provided on the empennage.

6. The vertical take-off and landing aircraft according to claim 1, wherein:

the vertical take-off and landing aircraft further comprises 2M fixed rotors, wherein M is a natural number greater than or equal to 2;

the 2M fixed rotors are symmetrically provided at the wings on both sides of the fuselage and provided at the outer side of the tilting rotors;

in the vertical take-off and landing state, projections of all the fixed rotors on the horizontal plane are centrally symmetrical about point A, and point A is provided in the symmetry plane of the fuselage; and

during the transition flight of the vertical take-off and landing aircraft, point G is provided at a side of point A close to the nose or point G coincides with point A, and point B is always provided at a side of point A close to the empennage.

7. The vertical take-off and landing aircraft according to claim 6, wherein the vertical take-off and landing aircraft comprises four tilting rotors and four fixed rotors; a distance from the center of gravity point G to point A is L1, $L1 \geqslant 0$, a distance from point A to point B is L2, $L2 > 0$, a spacing between the four fixed rotors along a fuselage extension direction is L3, and a spacing between the four tilting rotors along the fuselage extension direction is L4, then $0.1(L3+L4) \geqslant 4L1+2L2 \geqslant 0.01(L3+L4)$.

8. The vertical take-off and landing aircraft according to claim 1, wherein:

the empennage is a V-shaped tail, two tilting rotors are provided on the V-shaped tail, and the two tilting rotors are respectively provided at two upper tips of the V-shaped tail;

in the vertical take-off and landing state, along a direction parallel to a roll axis of the vertical take-off and landing aircraft, a distance between a rotation center of the tilting rotor on the empennage and a leading edge of the upper tip of the V-shaped tail is t1, and a chord length of the upper tip of the V-shaped tail is t2, and a ratio of t1 to t2 is 15% to 40%.

9. The vertical take-off and landing aircraft according to claim 1, wherein the tilting rotor provided on the empennage is a tilting-nacelle rotor, the tilting-nacelle rotor comprises a first rotor and a power pod, the first rotor is connected to the power pod, the power pod is rotatably connected to the empennage or the wing, and the power pod tilts synchronously with the first rotor during tilting process of the first rotor.

10. The vertical take-off and landing aircraft according to claim 9, wherein:

the first rotor comprises a propeller and a rotary drive device, and the propeller is provided on an output shaft of the rotary drive device; and

the power pod comprises a pod shell and a tilt mechanism provided in the pod shell, the tilt mechanism is configured to drive the rotary drive device to tilt, so as to drive the propeller to tilt.

11. A control method for the vertical take-off and landing aircraft according to claim 1, characterized by comprising following pitch control process:

allocating a pitch control distribution between the ruddervators and the 2N tilting rotors according to a current airspeed or a dynamic pressure; and

controlling the ruddervators and the 2N tilting rotors respectively according to the pitch control distribution to achieve pitch trim and maneuver.

12. The control method according to claim 11, wherein before the allocating the pitch control distribution between the ruddervators and the 2N tilting rotors according to the current airspeed or dynamic pressure, further comprising following rotor control process:

obtaining a current tilt position of each tilting rotor;

in response to the current tilt position being inconsistent with a set cruise position, obtaining a current airspeed or a dynamic pressure of a corresponding tilting rotor at the current tilt position,

and determining whether the current airspeed or the dynamic pressure is equal to or greater than a preset threshold value at the current tilt position;

in response to the current airspeed or the dynamic pressure being equal to or greater than the preset threshold value at the current tilt position, controlling the tilting rotor to tilt to a preset next position; and

increasing rotation speeds of the 2N tilting rotors gradually.

13. The control method according to claim 12, wherein the control method further comprises: executing the rotor control process and the pitch control process repeatedly in sequence until the tilting rotor is tilted to a cruise position, and a transition from a take-off to a horizontal flight is completed.

14. The control method according to claim 13, wherein before the controlling rotor, further comprising following take-off control process:

tilting the 2N tilting rotors to a rotation axis vertically upward or inclined upward;

deflecting the ruddervators downward;

starting the 2M fixed rotors and the 2N tilting rotors, and issuing a horizontal flight command in response to the vertical take-off and landing aircraft reaching a set altitude.

15. The control method according to claim 11, wherein:

the vertical take-off and landing aircraft further comprises 2M fixed rotors, wherein M is a natural number greater than or equal to 2; the 2M fixed rotors are symmetrically provided at the wings on both sides of the fuselage and provided at the outer side of the tilting rotors;

before the allocating the pitch control distribution between the ruddervators and the 2N tilting rotors according to the current airspeed or the dynamic pressure, further comprising following take-off control process:

tilting the 2N tilting rotors to a rotation axis horizontally forward;

deflecting the ruddervators downward; and

starting the 2M fixed rotors and the 2N tilting rotors, and issuing a horizontal flight command in response to the vertical take-off and landing aircraft reaching a set altitude.