What is claimed is:

1. A rotating electrical machine comprises :

a frame;

a rotating device including a rotor and a shaft fixed to the center of the rotor;

a first stator;

a second stator;

the rotating device, the first stator and the second stator being respectively accommodated inside the frame in a way that the rotor is configured to rotate by electromagnetically interacting with the first stator or/and the second stator, and the shaft rotates together with the rotor; and

a flywheel coupled to one end of the shaft and driven thereby, wherein the flywheel comprises a disc-shaped body coupled to the shaft of the rotating device, a pair of ball screw devices and a pair of masses; each of the ball screw devices includes a screw shaft and a pair of ball nuts, the screw shaft is radially pivoted within the disc-shaped body and has a middle section, a left section having forward threads, and a right section having reverse threads, one of the two nuts is screwed to the left section and the other ball nut is screwed to the right section, allowing each of the ball nuts can move back and forth between a starting position and an ending position; and one of the masses is coupled to the ball nuts screwed to the left sections of the screw shafts and the other mass is coupled to the ball nuts screwed to the right sections of the screw shafts so that the masses can approach or move away from the middle section synchronously, thereby allowing the moment of inertia of the flywheel to be variable.

2. The rotating electrical machine of claim 1, further comprises a cooling fan or another flywheel coupled to the opposite end of the shaft and driven thereby.

3. The rotating electrical machine of claim 1, wherein the first stator and the second

stator are arranged in sequence and spaced apart along the axis of the rotating shaft to share the rotor.

4. The rotating electrical machine of claim 1, wherein the rotor includes a plurality of permanent magnet pieces disposed on either a certain part or the entire core portion.
5. The rotating electrical machine of claim 4, wherein each permanent magnet piece is spacedly disposed around the shaft, and the magnetic pole of each permanent magnet piece is opposite to that of the adjacent permanent magnet piece.
6. The rotating electrical machine of claim 3, wherein the first stator includes a first input and/or output end, and the second stator includes a second input and/or output end, thereby when both the first stator and the second stator are connected to an external power supply through their respective input ends, the rotating electrical machine operates in the energy storage mode, conversely, when only the first input end of the first stator is connected to the external power supply, the rotating electrical machine can output electrical energy through the second output end of the second stator.
7. The rotating electrical machine of claim 1, wherein the flywheel further comprises a spring device arranged between the masses in a way that it can be stretched when the masses are moved away from each other and retracted when they are approached to each other.
8. The rotating electrical machine of claim 1, wherein the body includes a base plate, an annular wall extending upward from the periphery of the base plate, and a receiving space defined by the base plate and the annular wall for receiving the ball screw devices and the masses.
9. The rotating electrical machine of claim 8, wherein each of the masses has a left wing portion with a left recess, and a right wing portion with a right recess, the ball nuts screwed to the left sections of the screw shafts are respectively received in the left

recess and the right recess of one of the masses and the ball nuts screwed to the right sections of the screw shafts are respectively received in the left recess and the right recess of the other mass, thereby the masses can move synchronously with the ball nuts.

10. The rotating electrical machine of claim 9, wherein the flywheel further comprises a first and second springs and each of the masses has a left groove and a right groove, one end of the first spring is fixed in the left groove of one of the masses using a first pin, and the other end of the first spring is fixed in the left groove of the other mass using a second pin, and one end of the second spring is fixed in the right groove of one of the masses using another first pin, and the other end of the second spring is fixed in the right groove of the other mass using another second pin.

11. The rotating electrical machine of claim 9, wherein the flywheel further includes a pair of linear guide devices, each of the linear guide devices includes a track member fixed on the base plate parallel to and adjacent to the screw shaft of the ball screw device and a moving member assembled to the track member through intermediation of a plurality of balls being rolling elements, and the moving members located on one side of the track members are fixed in one of the masses, the moving members located on another side of the track members are fixed in the other mass.

12. An operating method of the rotating electrical machine comprising the following steps:

preparing a rotating electrical machine of any one of claims 1 to 11;

connecting the first and second stators to an external power supply to drive the flywheel to a certain rotational speed;

disconnecting the first and second stators or only the second stator from the external power supply to operate the rotating electrical machine in energy release mode or in both energy storage and release modes simultaneously; and

reconnecting the first and second stators or only the second stator to the external power supply when the moment of inertia of the flywheel is reduced to a certain value to operate the rotating electrical machine in energy storage mode.

13. The operating method of the rotating electrical machine of claim 12, further comprising a step of preparing a control device including an input end connected to an outer power supply and an output end connected to the input end of the first stator and the input end of the second stator to control the electrical connection between the first stator and the second stator and the external power supply.

14. The operating method of the rotating electrical machine of claim 13, further comprising a step of preparing a voltage stabilizer including an input end connected to the output end of the second stator and an output end connected to an outer loading.