CLAIMS

WHAT IS CLAIMED IS:

1. An upper electrode mechanism of a semiconductor processing apparatus comprising a radio frequency (RF) coil, a current sensor, and a current adjustment device, wherein:

the RF coil includes at least two parallelly-connected branches;

the current sensor is arranged on each of the branches and is configured to detect a branch current corresponding to the branch; and

the current adjustment device is ~~connected~~ arranged on~~to~~ the RF coil and is configured to adjust a branch current of ~~at least one~~each of the branches ~~according to the detected branch current~~ to cause branch currents of the branches to be equal~~.~~,

wherein the current adjustment device includes a first connection bar, a second connection bar, and a mobile connection bar, wherein the first connection bar is connected to an RF source through a matcher, the second connection bar being respectively connected to the at least two parallelly-connected branches, the mobile connection bar being movably connected to the first connection bar and the second connection bar, a connection point of the mobile connection bar and the first connection bar moving along the first connection bar, and a connection point of the mobile connection bar and the second connection bar moving along the second connection bar.

~~2. The upper electrode mechanism according to claim 1, wherein the current adjustment device includes a capacitance adjustment assembly, the capacitance adjustment assembly being connected to the at least two parallelly-connected branches to adjust capacitance of the at least one of the branches.~~

~~3~~2. The upper electrode mechanism according to claim ~~2~~1, wherein the ~~capacitance~~ current adjustment ~~assembly~~ device includes at least two adjustable capacitors, the at least two adjustable capacitors being arranged on the at least two parallelly-connected branches in a one-to-one correspondence.

~~4. The upper electrode mechanism according to claim 1, wherein the current adjustment device includes a first connection bar, a second connection bar, and a mobile connection bar, wherein the first connection bar is connected to an RF source through a matcher, the second connection bar being respectively connected to the at least two parallelly-connected branches, the mobile connection bar being movably connected to the first connection bar and the second connection bar, a connection point of the mobile connection bar and the first connection bar moving along the first connection bar, and a connection point of the mobile connection bar and the second connection bar moving along the second connection bar.~~

~~5. The upper electrode mechanism according to claim 4, wherein the first connection bar and the second connection bar are parallel to each other, the mobile connection bar is perpendicular to the first connection bar and the second connection bar, and two ends of the mobile connection bar are movably connected to the first connection bar and the second connection bar, respectively.~~

~~6~~3. The upper electrode mechanism according to claim ~~5~~1, wherein ~~the current adjustment device further includes two connection assemblies configured to movably connect~~

~~the~~ two ends of the mobile connection bar is connected to the first connection bar and the second connection bar, respectively through a connection assembly;

~~each~~ the connection assembly includes a first washer, a second washer, an elastic member, and a screw, wherein a strip-shaped groove is formed on each of the first connection bar and the second connection bar, threaded holes cooperating with the screw are formed at the two ends of the mobile connection bar, and a through-hole for the screw to pass through is formed on each of the first washer and the second washer;

the first washer ~~and the second washer are arranged oppositely, and the first washer is movably connected~~is attached to the first connection bar ~~and~~ or the second connection bar~~;~~ ~~and~~

~~the second connection bar is attached to one corresponding to the connection assemblies~~, the elastic member is arranged between the first washer and the second washer, the screw passes ~~from a side of the second washer away from the first washer~~ through the through-hole of the second washer, ~~the elastic member,~~ the through-hole of the first washer, the stripe-shaped groove of ~~one of~~ the first connection bar ~~and~~ or the second connection bar ~~corresponding to the connection assembly in sequence,~~ and is ~~threadedly~~ connected to the threaded hole of the mobile connection bar.

~~7. The upper electrode mechanism according to claim 1, wherein the RF coil includes an inner coil and an outer coil, both the inner coil and the outer coil including the at least two parallelly-connected branches.~~

~~8~~4. A semiconductor processing apparatus comprising a process chamber, the process chamber being provided with the upper electrode mechanism according to any one of claims 1 to ~~7~~3.

~~9~~5. A current control method of a radio frequency (RF) coil in a semiconductor processing apparatus, applied to the upper electrode mechanism according to any one of claims 1 to ~~7~~3, comprising:

~~detecting~~ obtaining branch currents of the at least two parallelly-connected branches of the RF coil;

determining whether the branch currents are equal to each other; and

in response to the branch currents being not equal to each other, ~~according to the detected branch currents,~~ adjusting the ~~branch current of the at least one of the branches~~current adjustment device arranged on the RF coil to cause the branch currents of the branches to be equal ~~according to the detected branch currents~~.

~~10~~6. The method according to claim ~~9~~5, wherein the ~~process chamber is provided with the upper electrode mechanism according to claim 2 or 3, and adjusting the branch current of the at least one of the branches~~adjusting the current adjustment device arranged on the RF coil to cause the branch currents of the branches to be equal ~~according to the detected branch currents~~ includes:

~~according to the detected branch currents,~~ adjusting ~~a~~one or more capacitance values of ~~an~~ one or more adjustable capacitors among at least two adjustable capacitors ~~on the at least one of the branches~~ to cause the branch currents of the branches to be equal, the at least two adjustable capacitors being arranged on the at least two parallelly-connected branches in a one-to-one correspondence.

~~11~~7. The method according to claim ~~9~~6, wherein the ~~process chamber is provided with the upper electrode mechanism according to claim 4 or 5, and adjusting the branch~~

~~current of the at least one of the branches~~ adjusting the current adjustment device arranged on the RF coil to cause the branch currents of the branches to be equal ~~according to the detected branch currents~~ includes:

adjusting ~~lengths of connection parts between~~a position of the connection point of the mobile connection bar and the first connection bar and a position of the connection point of the mobile connection bar and the second connection bar ~~and the branches at the macher by moving the mobile connection bar~~ to cause the branch currents of the branches to be equal.

~~12~~8. The method according to claim ~~11~~7, wherein the ~~process chamber is provided with~~ method is applied to the upper electrode mechanism according to claim ~~6~~3, and ~~adjusting the lengths of the connection parts between the first connection bar and the second connection bar and the branches at the macher by moving the mobile connection bar~~the adjusting a position of the connection point of the mobile connection bar and the first connection bar and a position of the connection point of the mobile connection bar and the second connection bar includes:

~~loosening~~ rotating the screw to move the screw in a direction away from the mobile connection bar to reduce a compression amount of the elastic member located between the first washer and the second washer;

moving the two ends of the mobile connection bar along the first connection bar and the second connection bar ~~the stripe-shaped groove~~ to ~~adjust~~ change the position of the connection point of the mobile connection bar and the first connection bar and the position of the connection point of the mobile connection bar and the second connection bar~~the positions of the connection points where the two ends of the mobile connection bar are connected to the first connection bar and the second connection bar, respectively~~; and

~~tightening~~ rotating the screw to move the screw in a direction close to the mobile connection bar to increase the compression amount of the elastic member located between the first washer and the second washer to fix the mobile connection bar ~~at the adjusted positions~~.