CLAIMS

What is claimed is:

1. An ultrasound-based handheld animal and plant tissue ablation instrument, comprising a housing (1) internally provided with a control board (4) and a drive board (5), and an ultrasonic vibrator fixedly connected to a front end of the housing; wherein

the ultrasonic vibrator comprises an ultrasonic transducer (2) and an amplitude transformer (3), wherein the amplitude transformer (3) is fixedly connected to a front end of the ultrasonic transducer, changes an amplitude of vibration input by the ultrasonic transducer and transmits out the vibration;

the control board is provided with a power supply, a direct current to direct current (DCDC) conversion unit, a main control unit, a DCDC power adjustment unit and a sampling unit; the drive board is provided with a drive unit, a transformer unit and a resonance unit; the DCDC conversion unit includes a first DCDC conversion unit, a second DCDC conversion unit and a third DCDC conversion unit; a voltage of the power supply is converted through the DCDC conversion unit and the DCDC power adjustment unit and then is supplied to the animal and plant tissue ablation instrument; the main control unit outputs a first pulse width modulation (PWM) signal to control the DCDC power adjustment unit to output an adjustable voltage, and outputs two second PWM signals with complementary duty cycles to the drive unit based on feedback from the sampling unit that acquires a voltage and a current of an output circuit of the transformer unit, the transformer unit transforms the voltage, and then the resonance unit arranged in the output circuit of the transformer unit adjusts a resonance point to a resonance point of the ultrasonic vibrator, so that the ultrasonic vibrator arranged in the output circuit of the transformer unit operates in a resonance state; and

the housing is a handheld housing, the housing comprises a first section and a second section that are disposed at an obtuse angle to each other, and an end of the first section away from the second section is the front end of the housing.

2. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the front end of the housing is provided with a connecting hole for fixedly connecting to the ultrasonic vibrator, an inner wall of the connecting hole is provided with one or more first clamping slots (103), and correspondingly, the ultrasonic vibrator is provided with a first step (801) matched with the first clamping slot.

3. The ultrasound-based handheld animal and plant tissue ablation instrument according

to claim 2, wherein both sides of the first step are provided with a first clamping block (802)

and a second clamping block (803) respectively, and the first step is clamped in the first clamping slot through the first clamping block and the second clamping block.

4. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 3, wherein the first clamping slot is a circular clamping slot, the first step is a circular step, both the first clamping block and the second clamping block are circular clamping blocks, and the first clamping block and the second clamping block are both sleeved on an outer wall of the ultrasonic vibrator.

5. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 2, wherein a front end of the ultrasonic vibrator provided with the first step is further sleeved with a first fixed cover (804), and a rear end of the first fixed cover is clamped in the first clamping slot.

6. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the housing comprises an upper housing (101) and a lower housing (102) that are engaged with each other;

a front end of the upper housing and a front end of the lower housing are further sleeved with a second fixed cover (805), an inner wall of the second fixed cover is provided with a second step (806), and outer walls of the front end of the upper housing and the front end of the lower housing are further provided with a second clamping slot (807) matched with the second step.

7. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein a hook (9) is arranged on an outer wall of the housing.

8. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the animal and plant tissue ablation instrument has power of 50-1000 W, and ultrasonic frequency of 20-200 kHz.

9. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the DCDC power adjustment unit comprises:

a switch control signal receiving circuit, wherein a switch control signal receiving terminal of the switch control signal receiving circuit is connected to the main control unit to

receive a switch control signal;

a first PWM signal receiving circuit, wherein a first PWM signal receiving terminal of the first PWM signal receiving circuit is connected to the main control unit to receive the first PWM signal; and

a fourth DCDC conversion unit, wherein the fourth DCDC conversion unit is configured to convert, through the switch control signal and the first PWM signal sent by the main control unit, the power supply to the adjustable voltage for output.

10. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 9, wherein the fourth DCDC conversion unit comprises a fourth voltage input filter, a fourth voltage conversion chip U1 and a fourth voltage output filter that sequentially process the voltage of the power supply; the fourth voltage input filter comprises a filter capacitor connected to the power supply; an upper tube drive signal reference point pin SW of the fourth voltage conversion chip U1 is connected to an adjustable voltage output terminal through an energy storage inductor L1; voltage divider resistors R32 and R47 connected in series with the adjustable voltage output terminal sample a voltage and input the voltage to a reference voltage pin FB of the fourth voltage conversion chip U1; the upper tube drive signal reference point pin SW of the fourth voltage conversion chip U1 is further connected to a freewheeling diode D2; an enable pin EN is connected to a resistor R33; a resistor timing/external clock pin RT/CLK is connected to a frequency divider resistor R85; a frequency compensation pin COMP is connected to a capacitor C51, a capacitor C49 and a resistor R46 that are used to adjust a circuit and stabilize voltage output, wherein the capacitor C51 and the resistor R46 are connected in series and then are connected with the capacitor C49 in parallel; the fourth voltage output filter comprises a filter capacitor connected to the adjustable voltage output terminal;

the switch control signal receiving circuit comprises a resistor R104, a resistor R105 and a transistor Q12, wherein the resistor R104 and the resistor R105 are connected in series between a converted voltage and the switch control signal receiving terminal, an emitter of the transistor Q12 is connected to the converted voltage, a base of the transistor Q12 is connected to a node between the resistor R104 and the resistor R105, and a collector of the transistor Q12 is connected to the enable pin EN of the fourth voltage conversion chip U1; when the switch control signal is L, the transistor Q12 is turned on, and the fourth voltage conversion chip U1 is activated to work; and

the first PWM signal receiving circuit comprises an RC filter and a first voltage follower

U3B that sequentially process the first PWM signal; the first PWM signal received by the first PWM signal receiving terminal is filtered through the RC filter and then input to a non-inverting input terminal of the first voltage follower U3B, and an output terminal of the first voltage follower U3B is connected to a node between the voltage divider resistors R32 and R47 through a voltage divider resistor R54.

11. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the drive unit comprises a first drive unit and a second drive unit; a second PWM signal receiving terminal N of the first drive unit receives a first-channel second PWM signal sent by the main control unit, and an output terminal of the first drive unit is connected to a dotted terminal of a primary coil of the transformer unit; a second PWM signal receiving terminal P of the second drive unit receives a second-channel second PWM signal sent by the main control unit, and an output terminal of the second drive unit is connected to a non-dotted terminal of the primary coil of the transformer unit; the first-channel second PWM signal received by the second PWM signal receiving terminal N controls a first drive metal-oxide-semiconductor (MOS) transistor Q6 to be on/off, and the second-channel second PWM signal received by the second PWM signal receiving terminal P controls a second drive MOS transistor Q2 to be off/on.

12. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 11, wherein the transformer unit is a push-pull transformer, and the adjustable voltage output terminal of the DCDC power adjustment unit is connected to a non-dotted terminal of a first primary coil and a dotted terminal of a second primary coil of the push-pull transformer;

the first drive unit comprises resistors R10 and R14 and the first drive MOS transistor Q6, wherein the resistors R10 and R14 are connected in series between the ground and the second PWM signal receiving terminal N, a gate of the first drive MOS transistor Q6 is connected to a node between the resistors R10 and R14, a source of the first drive MOS transistor Q6 is grounded, and a drain of the first drive MOS transistor Q6 is the output terminal of the first drive unit and is connected to a dotted terminal of the first primary coil of the push-pull transformer; and

the second drive unit comprises resistors R5 and R13 and the second drive MOS transistor Q2, wherein the resistors R5 and R13 are connected in series between the ground and the second PWM signal receiving terminal P, a gate of the second drive MOS transistor

Q2 is connected to a node between the resistors R5 and R13, a source of the second drive MOS transistor Q2 is grounded, and a drain of the second drive MOS transistor Q2 is the output terminal of the second drive unit and is connected to a non-dotted terminal of the second primary coil of the push-pull transformer.

13. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the resonance unit is a series LC resonator, and the series LC resonator comprises an inductor T1 and a capacitor C1 that are connected in series in the output circuit of the transformer unit.

14. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the sampling unit comprises a voltage sampling unit for acquiring a voltage of the output circuit of the transformer unit and a current sampling unit for acquiring a current of the output circuit of the transformer unit, and correspondingly, the output circuit of the transformer unit is provided with a plurality of sampling resistors connected in series; a voltage signal is acquired by a voltage sampling terminal connected to a node between the plurality of sampling resistors, is sent to the voltage sampling unit for filtering and amplification, and then is sent to the main control unit for resonance adjustment; a current signal is acquired by a current sampling terminal connected in series to the output circuit of the transformer unit, is sent to the current sampling unit for filtering and amplification, and then is sent to the main control unit for resonance adjustment.

15. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 1, wherein the main control unit comprises a main control chip U2 and a main control chip peripheral circuit; the main control chip U2 outputs the first PWM signal to control the DCDC power adjustment unit to output the adjustable voltage, and outputs the two second PWM signals with the complementary duty cycles to the drive unit based on the feedback from the sampling unit that acquires the voltage and the current of the output circuit of the transformer unit.

16. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 15, wherein the main control unit further comprises an auxiliary chip U1 and an auxiliary chip peripheral circuit; the main control chip U2 of the main control unit sends an instruction to the auxiliary chip U1 based on the feedback from the sampling unit that

acquires the voltage and the current of the output circuit of the transformer unit; the auxiliary chip U1 receives the instruction from the main control chip U2 and outputs the two second PWM signals with the complementary duty cycles to the drive unit, wherein the two second PWM signals with the complementary duty cycles are further fed back to the main control chip U2.

17. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 15, wherein the two second PWM signals with the complementary duty cycles are further amplified by a first signal amplifying output circuit and a second signal amplifying output circuit respectively and then are sent to the drive unit.

18. The ultrasound-based handheld animal and plant tissue ablation instrument according to claim 15, further comprising a display unit, a button, a charging interface, a memory, a USB interface unit and/or a touch unit connected to the main control chip U2; wherein when the main control chip U2 is connected to the button and the display unit, the button and a display screen of the display unit are arranged on a surface of the second section of the housing.