Claims

1. A welding device for gas shielded arc welding, the welding device comprising:

a portable welding robot mounted with a welding torch including a nozzle that guides jetting of shielding gas and a contact tip that performs energization on a consumable electrode;

a feeding device that supplies the consumable electrode to the welding torch;

a welding power source that supplies electric power to the consumable electrode via the contact tip;

a gas supply source that supplies the shielding gas to be jetted from an end of the nozzle; and

a control device that controls the portable welding robot, wherein,

when the welding torch is seen from a side of jetting of the shielding gas,

the contact tip is placed in an inside of an opening of the nozzle,

the nozzle and the contact tip have a relatively movable structure by tilting of the nozzle with respect to the contact tip without rotation, and

an inner diameter of the end of the nozzle is within a range of not less than 10 mm and not more than 20 mm.

2. The welding device according to claim 1, wherein

a nozzle tip gap distance between the inner diameter

of the end of the nozzle and an outer diameter of an end of the contact tip in an initial state is within a range of not less than 2 mm and not more than 7 mm, and

a relative movement distance between the nozzle and the contact tip is within a range of not less than of 30% and not more than 90% of the nozzle tip gap distance.

3. The welding device according to claim 1 or 2, wherein

a welding current supplied from the welding power source has a pulse waveform in which a combination of a first pulse and a second pulse is set as one period,

the first pulse has a higher peak current value than the second pulse, and

the second pulse has a longer peak span than the first pulse.

4. The welding device according to claim 3, wherein

a peak current value of the first pulse is within a range of not less than 400 A and not more than 600 A,

a peak current value of the second pulse is within a range of not less than 300 A and not more than 500 A,

a peak span of the first pulse is within a range of not less than 0.5 msec and not more than 3.5 msec, and

a peak span of the second pulse is within a range of not less than 1.5 msec and not more than 5.5 msec.

5. The welding device according to claim 4, wherein

the welding power source includes

a voltage detector that detects a welding arc voltage,

a current detector that detects a welding current, and

a droplet detachment detection section that detects detachment of a droplet formed at an end of the consumable electrode, and

the droplet detachment detection section, when it has detected the detachment of the droplet on a basis of at least one of the welding current, the arc voltage, and a ratio between an arc voltage and a welding current (V/I; resistance) obtained from the voltage detector and the current detector in a peak span of the first pulse, causes a peak current value of the first pulse to be reduced.

6. The welding device according to claim 5, wherein, when a cable length of a power cable that connects the welding power source and the portable welding robot together is denoted by L mm and a cable cross sectional area is by S mm^2, a rate of L to S (L/S; unit: 1/mm) has a relationship of $L/S \leq 10000$.

7. A gas shielded arc welding method using a welding device, wherein

the welding device is a device including

a portable welding robot mounted with a

welding torch including a nozzle that guides jetting of shielding gas and a contact tip that performs energization on a consumable electrode,

a feeding device that supplies the consumable electrode to the welding torch,

a welding power source that supplies electric power to the consumable electrode via the contact tip,

a gas supply source that supplies the shielding gas to be jetted from an end of the nozzle, and

a control device that controls the portable welding robot, in which,

when the welding torch is seen from a side of jetting of the shielding gas,

the contact tip is placed in an inside of an opening of the nozzle,

the nozzle and the contact tip have a relatively movable structure by tilting of the nozzle with respect to the contact tip without rotation, and

an inner diameter of the end of the nozzle is within a range of not less than 10 mm and not more than 20 mm,

a flow rate of the shielding gas is within a range of not less than 15 L/min and not more than 50 L/min, and

a flow velocity of the shielding gas is within a range of not less than 1 m/sec and not more than 10 m/sec.

8. The gas shielded arc welding method according to claim 7, wherein

a welding current supplied from the welding power source has a pulse waveform in which a combination of a first pulse and a second pulse is set as one period,

the first pulse has a higher peak current value than the second pulse, and

the second pulse has a longer peak span than the first pulse.

9. The gas shielded arc welding method according to claim 8, wherein

a peak current value of the first pulse is within a range of not less than 400 A and not more than 600 A,

a peak current value of the second pulse is within a range of not less than 300 A and not more than 500 A,

a peak span of the first pulse is within a range of not less than 0.5 msec and not more than 3.5 msec, and

a peak span of the second pulse is within a range of not less than 1.5 msec and not more than 5.5 msec.

10. A multilayer welding method that is a gas shielded arc welding method for multilayer welding using a welding device, wherein

the welding device is a device including

a portable welding robot mounted with a welding torch including a nozzle that guides jetting of shielding gas and a contact tip that performs energization on a consumable electrode,

a feeding device that supplies the consumable electrode to the welding torch,

a welding power source that supplies electric power to the consumable electrode via the contact tip,

a gas supply source that supplies the shielding gas to be jetted from an end of the nozzle, and

a control device that controls the portable welding robot, in which,

when the welding torch is seen from a side of jetting of the shielding gas,

the contact tip is placed in an inside of an opening of the nozzle,

the nozzle and the contact tip have a relatively movable structure by tilting of the nozzle with respect to the contact tip without rotation, and

an inner diameter of the end of the nozzle is within a range of not less than 10 mm and not more than 20 mm,

a flow rate of the shielding gas is within a range of not less than 15 L/min and not more than 50 L/min,

a flow velocity of the shielding gas is within a range of not less than 1 m/sec and not more than 10 m/sec, and

in a case of the multilayer welding,

(1) only a first layer,

(2) the first layer to a second layer, or

(3) the first layer to a third layer

are welded using, as a welding current supplied from the welding power source, a direct current of a constant voltage not using a pulse waveform, and

remaining layers are welded using, as the welding current, a welding current having a pulse waveform in which a combination of a first pulse and a second pulse is set as one period,

the first pulse has a higher peak current value than the second pulse, and

the second pulse has a longer peak span than the first pulse.