AMENDED CLAIMS

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1. (Amended) A combustion device for a melting furnace in which a fuel ejector for ejecting gas fuel into a combustion space above an area of a melting zone in which an object to be melted is present is disposed so as to eject the gas fuel from a lateral location in the combustion space, and

in which a combustion air feeder for feeding combustion air obliquely downward to the combustion space is disposed in a location above the fuel ejector, wherein

the fuel ejector comprises a first fuel ejector and a second fuel ejector lined up in one specific direction, as viewed in the lengthwise direction of fuel ejection;

at least one first fuel ejection orifice and at least one second fuel ejection orifice are provided to the first fuel ejector and the second fuel ejector, respectively, and the first fuel ejection orifice and the corresponding second fuel ejection orifice are disposed in a state lined up in the specific direction; and

a first ejection stream ejected from the first fuel ejector and a second ejection stream ejected from the second fuel ejector are configured so as to collide on the downstream side of ejection.

2. The combustion device for a melting furnace according to claim 1, wherein each of the first fuel ejector and the second fuel ejector comprises a single fuel ejection orifice; and the first ejection stream ejected from the first fuel ejection orifice positioned to one side in the specific direction and the second ejection stream ejected from the second fuel ejection orifice positioned to the other side in the specific direction are configured so as to collide on the downstream side of ejection.

3. The combustion device for a melting furnace according to claim 1, wherein a plurality of fuel ejection orifices is lined up in an orthogonal direction orthogonal to the specific direction as viewed in the lengthwise direction of fuel ejection, in each of the first fuel ejector and the second fuel ejector, and

in relation to the first fuel ejection orifices positioned on one side and second fuel ejection orifices positioned on the other side thus forming a pair in the specific direction, a first ejection stream ejected from the first fuel ejection orifices and a second ejection stream ejected from the second fuel ejection orifices are configured so as to collide on the downstream side of ejection between the fuel ejection orifices constituting a pair.

4. The combustion device for a melting furnace according to claim 3, wherein the plurality of first fuel ejection orifices provided to the first fuel ejector and the plurality of second fuel ejection orifices provided to the second fuel ejector are configured to widen in a radial fashion on the downstream side of ejection or to converge inside a predetermined range as viewed in the specific direction.

5. The combustion device for a melting furnace according to any of claims 2 through 4, wherein auxiliary ejection orifices are provided in a medial position in the specific direction between the first fuel ejection orifice and the second fuel ejection orifice in relation to the fuel ejection orifices constituting a pair in the specific direction, and in positions on both sides in the orthogonal direction orthogonal to the specific direction as viewed in the lengthwise direction of the fuel ejection in relation to the fuel ejection orifices constituting a pair in the specific direction.

6. The combustion device for a melting furnace according to any of claims 1 through 4, wherein each of the first fuel ejector and the second fuel ejector is provided with at least one fuel ejection orifice; and the amount of gas fuel of a first ejection stream ejected from the first fuel ejection orifice positioned to one side in the specific direction and the amount of gas fuel of a second ejection stream ejected from the second fuel ejection orifice positioned to the other side are configured so as to be capable of being mutually or independently adjusted.

7. A melting furnace, in which

a fuel ejector for ejecting gas fuel into a combustion space above an area of a melting zone in which an object to be melted is present is disposed so as to eject gas fuel from a lateral location in the combustion space;

a combustion air feeder for feeding combustion air obliquely downward to the combustion space is disposed in a location above the fuel ejector; and

the gas fuel is caused to combust; wherein

the combustion device for a melting furnace according to claim 1 is provided in a furnace wall.

8. The melting furnace according to claim 7, wherein

there is provided at least a pair of combustion devices having the fuel ejector and the combustion air feeder for feeding combustion air to gas fuel ejected from the fuel ejector; and

in a state where gas fuel is fed from the fuel ejector of the combustion device on a first side and combustion air is fed from a combustion air feeder, the combustion air feeder of the combustion device on a second side serves as an exhaust gas introduction unit for receiving from the combustion space the exhaust gas generated by combustion carried out by the combustion device on the first side, and alternating combustion for repeatedly combusting gas fuel and receiving exhaust gas in alternating fashion is carried out between the combustion devices constituting a pair.

9. The melting furnace according to claim 8, wherein

a pair of the combustion devices is provided on both sides with the movement direction of the object to be melted therebetween; and

the combustion air feeder of the combustion device on the second side is opened in a distal end in the axial direction of a flame formed by the combustion of gas fuel ejected from the fuel ejector of the combustion device on the first side.

10. (Amended) The melting furnace according to any of claims 7 through 9, wherein

in a furnace wall through-hole in which the fuel ejector is to be provided, the cross-sectional area of a furnace wall through-hole is gradually increased in progression from the distal end of the fuel ejector toward the inside end face of the melting furnace; and

the position of collision between a first ejection stream ejected from said at least one first fuel ejection orifice and a second ejection stream ejected from the respective second fuel ejection orifice is set further to the inner side of the furnace wall than the inside end face of the melting furnace.

CLAIMS

1. A combustion device for a glass melting furnace in which a fuel ejector for ejecting gas fuel not containing combustion air into a combustion space above an area of a melting zone for melting a glass material in which an object to be melted as a glass material is present is disposed so as to eject the gas fuel from a lateral location in the combustion space, and

in which a combustion air feeder for feeding combustion air obliquely downward to the combustion space is disposed in a location above the fuel ejector, wherein

the fuel ejector comprises a first fuel ejector and a second fuel ejector lined up in one specific direction as viewed in the lengthwise direction of fuel ejection, the specific direction being orthogonal to the lengthwise direction of fuel ejection;

at least one first fuel ejection orifice and at least one second fuel ejection orifice are provided to the first fuel ejector and the second fuel ejector, respectively, and the first fuel ejection orifice and the corresponding second fuel ejection orifice are disposed in a state lined up in the specific direction;

a plurality of fuel ejection orifices is lined up in an orthogonal direction orthogonal to the specific direction as viewed in the lengthwise direction of fuel ejection, in each of the first fuel ejector and the second fuel ejector,

in relation to the first fuel ejection orifices positioned on one side and second fuel ejection orifices positioned on the other side thus forming a pair in the specific direction, as viewed in a direction orthogonal to both the lengthwise direction of fuel ejection and the specific direction, a fuel ejection direction of a first ejection stream ejected from the first fuel ejection orifice slopes toward a second fuel ejection orifice-side relative to the lengthwise direction of fuel ejection, and a fuel ejection direction of a second ejection stream ejected from the second fuel ejection orifice slopes toward a first fuel ejection orifice-side relative to the lengthwise direction of fuel ejection, and

the first ejection stream ejected from the first fuel ejector and the second ejection stream ejected from the second fuel ejector are configured so as to collide on the downstream side of ejection;

the amount of gas fuel of the second ejection stream ejected from the second fuel ejection orifice positioned to the other side are configured so as to be capable of being mutually or independently adjusted; and

the combustion air supplied from the combustion air feeder to the combustion space is oriented toward the first ejection stream ejected from the first fuel ejection orifice and the second ejection stream ejected from the second fuel ejection orifice which collide on the downstream side of ejection.

[Claim 2] The combustion device for a glass melting furnace according to claim 1, wherein the plurality of first fuel ejection orifices provided to the first fuel ejector and the plurality of second fuel ejection orifices provided to the second fuel ejector are configured to widen in a radial fashion on the downstream side of ejection or to converge inside a predetermined range as viewed in the specific direction.

[Claim 3] The combustion device for a glass melting furnace according to claim 1 or 2, wherein auxiliary ejection orifices are provided in a medial position in the specific direction between the first fuel ejection orifice and the second fuel ejection orifice in relation to the fuel ejection orifices constituting a pair in the specific direction, and in positions on both sides in the orthogonal direction orthogonal to the specific direction as viewed in the lengthwise direction of the fuel ejection in relation to the fuel ejection orifices constituting a pair in the specific direction.

[Claim 4] A glass melting furnace, in which

a fuel ejector for ejecting gas fuel not containing combustion air into a combustion space above an area of a melting zone for melting a glass material in which an object to be melted as a glass material is present is disposed so as to eject the gas fuel from a lateral location in the combustion space;

a combustion air feeder for feeding combustion air obliquely downward to the combustion space is disposed in a location above the fuel ejector; and

the gas fuel is caused to combust; wherein

the combustion device for a glass melting furnace according to claim 1 is provided in a furnace wall.

[Claim 5] The glass melting furnace according to claim 4, wherein

there is provided at least a pair of combustion devices having the fuel ejector and the combustion air feeder for feeding combustion air to the gas fuel ejected from the fuel ejector; and

in a state where the gas fuel is fed from the fuel ejector of the combustion device on a first side and combustion air is fed from a combustion air feeder, the

combustion air feeder of the combustion device on a second side serves as an exhaust gas introduction unit for receiving from the combustion space the exhaust gas generated by combustion carried out by the combustion device on the first side, and alternating combustion for repeatedly combusting the gas fuel and receiving exhaust gas in alternating fashion is carried out between the combustion devices constituting a pair.

[Claim 6] The glass melting furnace according to claim 5, wherein

a pair of the combustion devices is provided on both sides with the movement direction of the object to be melted therebetween; and

the combustion air feeder of the combustion device on the second side is opened in a distal end in the axial direction of a flame formed by the combustion of gas fuel ejected from the fuel ejector of the combustion device on the first side.

[Claim 7] The glass melting furnace according to any of claims 4 through 6, wherein

in a furnace wall through-hole in which the fuel ejector is to be provided, the cross-sectional area of a furnace wall through-hole is gradually increased in progression from the distal end of the fuel ejector toward the inside end face of the glass melting furnace; and

the position of collision between a first ejection stream ejected from said at least one first fuel ejection orifice and a second ejection stream ejected from the respective second fuel ejection orifice is set further to the inner side of the furnace wall than the inside end face of the glass melting furnace.