CLAIMS

[Claim 1]

A melting device for discharging a melt of a substance into a tank to melt the substance stored in the tank, the device comprising

a suction pipe attached to the wall of the tank;

a discharge pipe attached to the wall of the tank;

a circulation flow path disposed on the outside of the tank; and

a hopper in which the melt of the substance is to be stored and that is connected to the circulation flow path via an on-off valve;

wherein

the inside of the tank communicates with the inside of one end of the circulation flow path through the inside of the suction pipe;

the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the discharge pipe;

a pump is disposed at a midway position of the circulation flow path; by driving the pump, the melt of the substance that is present in the tank is suctioned into the suction pipe, circulated through the circulation flow path, and discharged from inside the discharge pipe into the tank; and the entire inside of the discharge pipe is used as a flow path for the melt;

the hopper comprises a primary-side hopper and a secondary-side hopper;

the primary-side hopper is connected to the primary side of the pump in the circulation flow path via a primary-side on-off valve;

the secondary-side hopper is connected to the secondary side of the pump in the circulation flow path via a secondary-side on-off valve; and

the pump is capable of pumping a fluid in a reverse direction.

[Claim 2]

The melting device according to claim 1, wherein

a metal pipe is wound around the outer circumference of the hopper; and

steam or hot water is allowed to flow inside the metal pipe with the substance being placed in the hopper to thereby melt the substance in the hopper and store the melt in the hopper.

[Claim 3]

A melting device for discharging a melt of a substance into a tank to melt the substance stored in the tank, the device comprising

a suction pipe attached to the wall of the tank;

a discharge pipe attached to the wall of the tank; and

a circulation flow path disposed outside the tank; wherein

the inside of the tank communicates with the inside of one end of the circulation flow path through the inside of the suction pipe;

the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the discharge pipe;

a pump is disposed at a midway position of the circulation flow path; by driving the pump, the melt of the substance that is present in the tank is suctioned into the suction pipe, circulated through the circulation flow path, and discharged from inside the discharge pipe into the tank; and the entire inside of the discharge pipe is used as a flow path for the melt;

the discharge pipe comprising a mixing ejector

comprising a nozzle and a diffuser;

the nozzle ejecting the melt sent through the circulation flow path into the diffuser,

the diffuser suctioning the melt present in the tank by a pressure decrease due to injection of the melt from the nozzle, and ejecting the suctioned melt into the tank together with the melt injected from the nozzle.

[Claim 4]

A method for melting a substance stored in a tank by using a melting device,

the melting device being configured to discharge a melt of a substance into the tank to melt the substance stored in the tank,

the device comprising:

a suction pipe attached to the wall of the tank;

a discharge pipe attached to the wall of the tank;

a circulation flow path disposed outside the tank; and

a hopper in which the melt of the substance is to be stored and that is connected to the circulation flow path via an on-off valve;

wherein

the inside of the tank communicates with the inside of one end of the circulation flow path through the inside of the suction pipe;

the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the discharge pipe;

a pump is disposed at a midway position of the circulation flow path; by driving the pump, the melt of the substance that is present in the tank can be suctioned into the suction pipe, circulated through the circulation flow path, and discharged from inside the discharge pipe into the tank; and

the entire inside of the discharge pipe is used as a flow path

for the melt; and

the method comprising the steps of

taking out a part of the substance solidified in the tank;

storing in the hopper a melt obtained by melting the substance taken out from the tank;

driving the pump with the on-off valve being open to supply the melt stored in the hopper into the discharge pipe through the circulation flow path and discharging the melt from the opening at the tip of the discharge pipe into the tank, whereby the substance present in the vicinity of the discharge pipe among the substance present in the tank is melted to form a melt; and

driving the pump with the on-off valve being closed to suction the melt present in the tank into the suction pipe and supply the melt into the discharge pipe through the circulation flow path, and discharge the melt from the opening at the tip of the discharge pipe into the tank to thereby melt the substance present in an unmelted state in the tank.

[Claim 5]

The melting device according to claim 1 comprising a double pipe,

the double pipe comprising

an outer pipe that forms the suction pipe;

an inner pipe that forms the discharge pipe; and

a coupling;

wherein

the inner pipe passes inside of the outer pipe;

the inside of the tank communicates with the inside of one end of the circulation flow path through a space outside of the inner pipe in the outer pipe; the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the inner pipe;

a pump disposed at a midway position of the

circulation flow path is driven, whereby the melt of the substance that is present in the tank can be suctioned into a space outside of the inner pipe in the outer pipe, circulated through the circulation flow path, and discharged from the inside of the inner pipe into the tank; the entire inside of the inner pipe is used as a flow path for the melt;

the coupling comprises a cylindrical coupling body and a lever that is tiltably attached to the coupling body;

the base end side of the coupling body is covered with the tip side of the outer pipe;

by tilting the lever, the degree of projection of the lever to the inside of the coupling body can be reduced; and by tilting the lever in the opposite direction, the degree of projection of the lever to the inside the coupling body can be increased;

the inner pipe passes through the inside of the outer pipe and the inside of the coupling body; the base end side of the inner pipe extends from the base end side position of the outer pipe; at the base end side of the outer pipe, the gap between the outer pipe and the inner pipe is blocked by an annular member; and

the tip side of the inner pipe extends from the tip of the coupling body.

[Claim 6]

The melting device according to claim 5, wherein the double pipe is a combination of a first member and a second member,

the first member comprising a base end side of the outer pipe, the annular member, and the inner pipe,

the second member comprising the tip side of the outer pipe and the coupling,

wherein

a first flange is provided on the base end side of the outer pipe, and a second flange is provided on the tip side

of the outer pipe,

the first flange and the second flange each project radially outwardly of the outer pipe and extend in the circumferential direction of the outer pipe,

the first flange and the second flange are butt-jointed and bolted together to combine the first member and the second member, thus forming the double pipe; and by unfastening the bolts, the double pipe can be disassembled into the first member and the second member.

[Claim 7]

A melting device for discharging a melt of a substance into a tank to melt the substance stored in the tank, the device comprising

a suction pipe attached to the wall of the tank;

a discharge pipe attached to the wall of the tank; and

a circulation flow path disposed outside the tank, wherein

the inside of the tank communicates with the inside of one end of the circulation flow path through the inside of the suction pipe; and the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the discharge pipe;

a pump is provided at a midway position of the circulation flow path; by driving the pump, the melt of the substance that is present in the tank can be suctioned into the suction pipe, circulated through the circulation flow path, and discharged from inside the discharge pipe into the tank; and the entire inside of the discharge pipe is used as a flow path for the melt;

the substance is a wax or oil/fat; and

the tank is made of a vinyl compound or a metal and does not comprise a means for cooling the substance stored inside.

[Claim 8]

The melting device according to claim 7, wherein the discharge pipe having a small diameter is disposed inside of the suction pipe having a large diameter, and the inside of the tank communicates with the inside of one end of the circulation flow path through a space outside of the discharge pipe in the suction pipe.

[Claim 9]

The melting device according to claim 7, further comprising a hopper in which a melt of a substance can be stored, wherein the hopper is connected to the circulation flow path via an on-off valve.

[Claim 10]

The melting device according to claim 9, wherein

a metal pipe is wound around the outer circumference of the hopper; and

steam or hot water is allowed to flow inside of the metal pipe with the substance being placed in the hopper to thereby melt the substance in the hopper and store the melt in the hopper.

[Claim 11]

The melting device according to claim 7, comprising a heating means that is buried in the wall of the tank.

[Claim 12]

The melting device according to claim 7, comprising a heating means that is disposed outside the tank and abuts the wall of the tank.

[Claim 13]

The melting device according to claim 7, comprising a heating means disposed inside of the tank.

[Claim 14]

The melting device according to any one of claims 11 to 13, wherein the heating means is a tubular body through which hot water or steam is allowed to flow.

[Claim 15]

The melting device according to any one of claims 11 to 13, wherein the heating means is a pad with a conductor that generates heat through electrical resistance.

[Claim 16]

The melting device according to any one of claims 11 to 13, wherein the direction of the discharge pipe is adjusted so that the melt discharged from the inside of the discharge pipe into the tank is directed to the position of the heating means.

[Claim 17]

The melting device according to claim 7, comprising a melt heating means that is disposed at a midway position in the circulation flow path and that heats the melt flowing through the circulation flow path.

[Claim 18]

The melting device according to claim 7, wherein a spray nozzle through which the melt is sprayed is attached to the tip of the discharge pipe.

[Claim 19]

The melting device according to claim 7, further comprising a gas supply means capable of supplying heated gas to the circulation flow path.

[Claim 20]

The melting device according to claim 7, comprising a

double pipe,

the double pipe comprising

an outer pipe that forms the suction pipe; and

an inner pipe that forms the discharge pipe;

wherein

the inner pipe passes inside the outer pipe;

the inside of the tank communicates with the inside of one end of the circulation flow path through a space outside of the inner pipe in the outer pipe; and the inside of the tank communicates with the inside of the other end of the circulation flow path through the inside of the inner pipe;

by driving a pump disposed at a midway position of the circulation flow path, the melt of the substance that is present in the tank can be suctioned into a space outside of the inner pipe in the outer pipe, circulated through the circulation flow path, and discharged from the inside of the inner pipe to the inside of the tank; and the entire inside of the inner pipe is used as a flow path for the melt.