

22 SEP 2000

TITLE OF THE INVENTION

Thermal Insulating Material

1. BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a thermal insulating material which can be fixed to or removed from a metallic thermal radiating surface of an injection molding die or a tank requiring to keep either a heated state or a cold state, for example.

DESCRIPTION OF THE RELATED ART

In the related art, although a plastic injection molding is carried out such that heated and molten thermoplastic resin is pressed into a die under a high pressure and molded there, the die is influenced by a temperature of the pressed molten resin and its temperature is increased, so that it is generally carried out that coolant is circulated in a flow passage of the die to solidify the molten resin and cool it so as to solidify the molten resin.

Fast cooling in this operation makes the molding cycle fast to cause a cost-down of the molded product, so that the fast cooling is carried out by supplying chilled water to the flow passage of the die.

In addition, in the case of engineering plastic

material having a high melting viscosity, the plastic material is molded while keeping a temperature of the die at a high temperature with thermal medium of high temperature. In this case, thermal radiation radiated from the surface of the die becomes loss.

Further, a large number of dies described above of different sizes or different structures are prepared in advance in compliance with the molded product and after molding a predetermined amount of one molded product, the dies are exchanged with the other dies and then the subsequent molded products are molded in sequence.

In turn, a fermentation tank, which is one example of the tank requiring to keep either a heated state or a cold state generated heat at the stage of fermentation of food and this heat was radiated from the surface of the tank.

2. SUMMARY OF THE INVENTION

However, such a related art injection molding die as described above shows a high temperature at its surface when the die is heated, resulting in that if a worker touches the die by accident, the worker may have a possibility taking fire burn at the body and in turn when the die is cooled with cold water, dew formation is quite easily produced at the surface of the die due to the fact that surrounding atmosphere around

the die shows a high temperature and then it shows a problem that a defective molding is produced with this dewdrop or this dewdrop may cause the molding device to be troubled.

In addition, the fermentation tank which is one example of the tank requiring to keep either a heated state or a cold state shows a problem that it has a high amount of heat loss due to the fact that heat generated during the fermentation process of the food is radiated from the surface of the tank.

It is an object of the present invention described in claim 1 to attain a thermal insulation only at a required location by a simple work in an optional manner.

It is a further object of the present invention described in claim 2 to prevent a fire burn during heating operation and to prevent a dew formation during a cooling operation in addition to the object of the invention described in claim 1.

It is a still further object of the present invention to keep a tank requiring of keeping either a heated state or a cold state at a heated state or a cold state in addition to the object of the present invention described in claim 1.

In order to accomplish the aforesaid object, the invention described in claim 1 of the present invention, the present invention is characterized in that a magnetic sheet

which can be fixed to or removed from a metallic thermal radiating surface is adhered to one surface of a thermal insulating sheet which can be resiliently deformed and cut.

The invention described in claim 2 is characterized in that a constitution in which said metallic thermal radiating surface is a non-molding surface of an injection molding die is added to the constitution of the invention described in claim 1.

The invention described in claim 3 is characterized in that a constitution in which said metallic thermal radiating surface is an outer surface of a tank requiring to keep either a heated state or a cold state is added to the constitution of the invention described in claim 1.

The invention described in claim 1 is constituted that the thermal insulating sheet is freely cut in compliance with a required shape of the metallic thermal radiation surface and then the sheet is fixed against the metallic thermal radiation surface by the magnetic sheet.

Since the invention described in claim 2 is made such that a constitution in which the metallic thermal radiation surface is a non-molding surface of the injection molding die is added to the constitution described in claim 1, so that the thermal insulating sheet is cut in compliance with out

of a cavity surface of the injection molding die and fixed with the magnetic sheet, thereby either the heating or the cooling of the die is thermally insulated and the heat is not transferred up to the surface of the thermal insulating sheet.

Since the invention described in claim 3 is constructed such that a constitution in which the metallic thermal radiating surface is an outer surface of a tank requiring to keep either a heated state or a cold state is added to the constitution described in claim 1, the thermal insulating sheet is cut in compliance with the outer surface of the tank requiring to keep either a heated state or a cold state, curved and fixed with the magnetic sheet, thereby the outer surface of the tank requiring to keep either the high temperature or the low temperature is thermally insulated and thermal radiation is not carried out.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A and 1B are perspective views for showing a thermal insulating material to indicate one preferred embodiment of the present invention, wherein 1A indicates a case in which a magnetic sheet is adhered to an entire rear surface of the thermal insulating sheet, and 1B indicates a state of selling for a rolled-up sheet.

Fig. 2 is a front elevational view for showing a state

in which the thermal insulating material is attached to out of a cavity surface of the injection molding die.

Fig. 3 is a perspective view for showing a state in which the thermal insulating material is attached to the outer surface of the tank requiring to keep either a heated state or a cold state.

3. DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, one preferred embodiment of the present invention will be described as follows.

As shown in Figs. 1A and 1B and 2, this preferred embodiment indicates a case in which the thermal insulating material A is constituted by adhering the magnetic sheet 2 that can be fixed to or removed from the metallic thermal radiating surface S against one surface of the thermal insulating sheet 1 and further the metallic thermal radiating surface S is out of a cavity surface of each of the injection molding dies B, B.

The aforesaid thermal insulating sheet 1 is made such that the most-suitable foamed material is selected from rubber, polyurethane, polyethylene and polypropylene and the like, for example, which can be resiliently deformed and cut in response to its object and condition, formed into the most-suitable thickness size, and at the same time its surface

1a of this sheet is worked with an embossing process as shown in Fig. 1A, thereby no wrinkle is produced at the sheet when the sheet is bent and further wiping-off of stains at the surface can be easily carried out.

In the case of the illustrated example, regular-grid patterns 1b are printed in a predetermined spaced apart relation on the surface to cause themselves to act as guides when the sheet is to be cut.

In addition, a magnetic sheet 2 is adhered to the rear surface of the thermal insulating sheet 1 through a fixing means 1c such as adhesive agent or a double-surface adhering tape.

As shown in Fig. 1A, the magnetic sheet 2 having the same size as that of the thermal insulating sheet 1 is adhered over the entire rear surface of the thermal insulating sheet 1.

Then, the thermal insulating material A completed while the magnetic sheet 2 is adhered to the thermal insulating sheet 1 is sold under a sheet state cut to its regular size or as shown in Fig. 1B, it is sold under a wound-up rolled state, and a user cuts this sheet into a required shape and fixes it to the metallic thermal radiation surface S.

In the case that the aforesaid thermal insulating

material A is attached to out of a cavity surfaces of the injection molding dies B, B as the metallic thermal radiation surface S, at first, the thermal insulating sheet 1 of the thermal insulating material A is freely cut in compliance with the required shape of the non-molding surfaces S, S together with the magnetic sheet 2.

In the case of example shown in the figure, the sheet is cut in compliance with an outer surface exposed in the surrounding atmosphere while being adjacent to the molding surface B1 of the injection molding dies B, B and in turn in the case that the heating and cooling pipes B2,... are to be connected, the sheet is cut out in compliance with these pipes.

Next, the work is completed only with adhering of the cut thermal insulating material A to the outer surface adjacent to the molding surface B1 acting as the metallic thermal radiating surfaces S, S with the magnetic sheet 2 adhered in advance to the rear surface of it.

With such an arrangement as above, the heating or cooling of the injection molding dies B, B is thermally insulated and this heating action is not transferred to the surface of the thermal insulating sheet 1.

As a result, in the case of heating operation, it is

possible to prevent a fire burn and in the case of cooling operation, it is possible to prevent a dewdrop.

Accordingly, even if a worker touches the heated die by accident, the worker is safe and a defective molding caused by dewdrop is not generated and this does not become a cause of trouble in the molding device as well.

In turn, the product shown in Fig. 3 is another preferred embodiment of the present invention, wherein the constitution in which the metallic thermal radiation surface S is applied as an outer surface of the fermentation tank C as one example of the tank requiring to keep either a heated state or a cold state is different from that of the preferred embodiment shown in Figs. 1A and 1B and 2 and the other constitutions are the same as those of the preferred embodiment shown in Figs. 1A and 1B and 2.

In the case that the aforesaid thermal insulating material A is fixed to the outer surface of the fermentation tank C as the metallic thermal radiation surface S, at first, the thermal insulating sheet 1 of the thermal insulating material A is freely cut together with the magnetic sheet 2 in compliance with a required shape of the outer surface S and then the cut thermal insulating material A is merely adhered to the outer surface S with the magnetic sheet 2

adhered to the rear surface in advance, resulting in that the work is completed in the same manner as that of the aforesaid preferred embodiment.

In particular, since the outer surface S of the fermentation tank C is a curved surface, either a groove of V-shaped sectional surface or a slit 3 as shown in Fig. 3 is formed at both the thermal insulating sheet 1 and the magnetic sheet 2 or the thermal insulating sheet 1 as required, the thermal insulating material A may easily be curved along the outer surface S of the curved surface.

With such an arrangement as above, the outer surface S of the fermentation tank C is thermally insulated and no thermal radiation occurs.

As a result, the fermentation tank C can be kept at its heated state.

Accordingly, no heat loss occurs and an economical state of the device can be attained and the temperature control becomes accurate without being influenced by a surrounding temperature of the fermentation tank C.

In the aforesaid preferred embodiment, although there have been illustrated one case that the metallic thermal radiation surface S is the outer surface of the injection molding die B and the other case that as one example of the

tank requiring to keep either a heated state or a cold state the metallic thermal radiation surface S is an outer surface of the fermentation tank C, the present invention is not limited to this preferred embodiment, and it is also applicable that the thermal insulating material A can be attached to either a cooling tank of a die cooling machine or a water tank or the like requiring a heated state or a cold state.

Further, although the thermal insulating sheet 1 is formed by the foamed material that can be resiliently deformed or cut, the present invention is not limited to this preferred embodiment and the thermal insulating sheet 1 can be formed by flame retardant material that can be resiliently deformed or cut such as glass wool or glass cloth or ceramic sheet or rock wool and the like, for example.

As described above, the invention described in claim 1 of the present invention has an effect that only a required location can be easily machined and optionally thermally insulated due to the fact that the thermal insulating sheet is freely cut in compliance with a required shape of the metallic thermal radiation surface and the thermal insulating sheet is attached to the metallic thermal radiation surface with the magnetic sheet.

Accordingly, even a normal person having no special technique can prevent thermal radiation from the metallic thermal radiation surface in an easy manner.

In addition to the effect of the invention described in claim 1, the invention described in claim 2 can prevent fire burn in the case of heating operation and further prevent dewdrop in the case of cooling operation due to the fact that the heating or cooling of the die is thermally insulated and is not transferred to the surface of the thermal insulating sheet by cutting the thermal insulating sheet in compliance with out of a cavity surface of the injection molding die and attached to the product with the magnetic sheet.

Accordingly, in the case of heating operation, its surface temperature is increased up to such a degree as one to cause a fire burn to occur and in turn in the case of cooling operation performed with cold water, even if a worker touches the heated die by accident, it is safe as compared with that of the related art product in which a dewdrop is quite easily produced, resulting in that no defective molding under dewdrop is produced and it does not become a cause of trouble of the molding device.

Further, since a surrounding temperature of the die does not influence the present invention, its temperature

control becomes accurate and the thermal insulating sheet can be freely cut, a hole can be easily opened at the product in compliance with the heating pipe and the cooling pipe.

In addition, since the thermal insulating material can be fixed to or removed from the die, a maintenance work for the die can be easily carried out and the thermal insulating material can be attached to another exchanged die, resulting in that it is not necessary to prepare a plurality of sets of thermal insulating material in compliance with the total number of the dies, it is quite economical and further it does not require any space for storing the non-applied thermal insulating material.

In addition to the effect of the invention described in claim 1, the invention described in claim 3 is made such that the thermal insulating sheet is cut in compliance with the outer surface of the tank requiring to keep either a heated state or a cold state and the cut sheet is attached while it is being curved with the magnetic sheet, the outer surface of the tank requiring to keep either a heated state or a cold state is thermally insulated not to radiate heat, so that the tank requiring to keep the heated state or the cold state can be kept at its heated state or cold state.

Accordingly, as compared with the related art product

in which the heat is radiated from the surface of the tank, no heat loss occurs in the present invention to attain an economical operation and further it is not influenced by the surrounding temperature of the tank, its temperature control becomes accurate and further in the case of cooling operation, dewdrop can be prevented.

Having described specific preferred embodiments of the invention with reference to the accompanying drawings, it will be appreciated that the present invention is not limited to those precise embodiments, and that various changes and modifications can be effected therein by one of ordinary skill in the art without departing from the scope of the invention as defined by the appended claims.



WHAT IS CLAIMED IS:

1. A thermal insulating material characterized in that a magnetic sheet which can be fixed to or removed from a metallic thermal radiating surface is adhered to one surface of a thermal insulating sheet which can be resiliently deformed and cut.
2. A thermal insulating material according to claim 1, wherein said metallic thermal radiating surface is out of a cavity surface of an injection molding die.
3. A thermal insulating material according to claim 1, wherein said metallic thermal radiating surface is an outer surface of a tank requiring to keep either a heated state or a cold state.