

OUR REF: GD:023303
CONTACT: Gavin Doherty
E-MAIL: gdoherly@mdppatents.com.au

24 March 2023

International Preliminary Examining Authority
AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606,
AUSTRALIA

Dear Sir/Madam

Re: International PCT Patent Application No. PCT/AU2023/051339
Title: Material Chilling/Freezing System
Applicant: HIVE CHILLING IP Pty Ltd

We refer to the written opinion of the International Preliminary Examining Authority, dated 19 December 2024, issued in relation to this application.

We have reviewed the comments made by the Examiner in relation to the objections raised in relation to unity of invention, novelty and inventiveness of the claims and propose to amend the claims as attached in clean and marked up versions.

UNITY OF INVENTION

With regard to the objection made against the lack of unity of invention of the claims presently on file, the claims have been amended to delete previous claims 1 – 7 and to amend previous independent claims 8 and 12 such that they each relate to a system and method for freezing/chilling materials. We maintain that the claims are now directed to a single inventive concept thereby overcoming this objection.

LACK OF SUPPORT

With regard to the objection made by the Examiner alleging that the claims are broader than justified by the contribution to the art, we disagree with this objection.

The Applicant is fully entitled to claim the system and method of the present invention when applied to freezing/chilling any type of applicable material outside of those materials identified in the preferred embodiment of the invention. There is support in the description for such broad application and we maintain that there is justification for such broad claim language.

NOVELTY

The system claim (new claim 1) has been amended to further define that the at least one module has materials supplied under positive pressure by a pump and the positive pressure is controlled so that the material is stored within the module as a stationary batch of material for freezing/chilling. It is this stationary batch of material that undergoes at least partial freezing and defrosting to be ejected from the outlet of the module as an at least partially frozen batch of material. The claim further defines that this is achieved by the flow of material being controlled to facilitate an initial flow of material into the module at which time it is stopped to

enable that batch of material to be at least partially frozen. Following the defrost step, the flow is recommenced to cause the batch of at least partially frozen material to move from the module into the outlet of the module under the pressure of the flow of material supplied by the pump.

The same amendments have been made to the method claim (new claim 9).

We maintain that the claims, as amended, are indeed novel over the document referred to by the Examiner as D1. D1 is directed to a continuous process for freezing a flow of aqueous material by continuously pumping the aqueous material into the tube under pressure to control the change in state of the aqueous material to form a "self-lubricating frozen extrusion".

As is described in D1, this can only be achieved by maintaining the flow of the aqueous material in a constant manner to create a semi-frozen extrusion comprising dendritic crystals and entrapped liquid to prevent the frozen material from becoming fully frozen and expanding within the tube. Thus, the very purpose of the invention of D1 is to retain the aqueous material in a continuous flow through the tube to avoid the material becoming frozen and being unable to flow through the tube.

This contrasts significantly to the presently claimed invention which seeks to process batches of material and uses the pressure of the supply pump in combination with a defrost step to facilitate flow and ejection of the at least partially frozen batch of material from the module. On this basis, we maintain that the presently amended claims are novel over the disclosure of D1.

Further to this, due to the continuous flow nature of the material being processed in D1, there is no need for a defrost step/process and as such, this provides further support of the novelty of the claim over D1.

With regard to D2 and D3, neither of these documents disclose a system having the features of the claims as amended.

INVENTIVE STEP

With regard to the Examiner's suggestion that:

"The difference between D1 and the claimed invention is that the claim requires "after a predetermined time, introducing a defrost heat exchange medium into the module to replace the refrigerant heat exchange medium to cause the material at the interface of the module to at least partially melt. This difference is considered obvious in light of D1 as D1 discloses a programmable controller which controls the flow of material into the extrusion tube, and the temperature of the cooling element by way of controlling the refrigerant parameters (as discussed above)."

We disagree with this assessment.

The entire purpose of the system of D1 is to retain the material in a flowable state so that at least some liquid aqueous material is entrapped between the frozen aqueous material to form a self-lubricating aqueous material. On this basis, there is no need for the system of D1 to have a defrost step as the flowing material is intended to retain the self-lubricating nature of material due to the presence of the liquid entrapped in the frozen material.

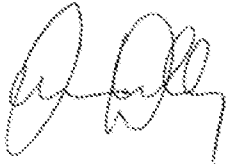
Thus, there is no motivation for a person skilled in the art to introduce a defrost step into the system of D1.

For this reason we maintain that the amended claims are also inventive in light of D1 and any of the other cited documents either alone or in combination.

If the examiner retains any objections to patentability in light of the amendments made, the applicant invites the examiner to issue a further written opinion.

Yours sincerely,

mdp Patent and Trade Mark Attorneys Pty Ltd

A handwritten signature in black ink, appearing to read 'Gavin Doherty', with a stylized, cursive script.

Gavin Doherty

Director

Patent and Trade Mark Attorney

The claims defining the invention are as follows:

1. A system for freezing/chilling materials, comprising:
 - an inlet for receiving the materials;
 - a pump for applying a positive pressure to the materials to facilitate flow of the materials through the system;
 - at least one module in fluid communication with the pump to receive the materials and to store the materials therein for a predetermined period of time as a stationary batch of material for freezing/chilling, the at least one module having an internal wall in communication with the stationary batch of material stored therein that is adapted to apply a low temperature to the materials to at least partially freeze the stationary batch of material and which is adapted to apply a heat to the at least partially frozen stationary batch of material to defrost the stationary batch of material at an interface between the stationary batch of material and the internal wall; and
 - an outlet for receiving the at least partially frozen batch of material from the at least one module;
 - wherein, the flow of the material is controllable to deliver the material into the at least one module and to stop further flow of the material into the at least one module to form the stationary batch of material within the at least one module, and the flow of the material is further controllable to recommence flow of the material into the at least one module following the defrost to cause the at least partially frozen batch of material to be received by the outlet from the at least one module.
2. A system according to claim 1, wherein the at least one module comprises a body forming a conduit and the internal wall defines an internal space formed within the conduit for receiving the stationary batch of material for chilling/freezing, and the body further comprises an external wall spaced from the internal wall to define at least one channel formed therebetween that extends a length of the body to receive a heat exchange medium.
3. A system according to claim 2, wherein the body is extruded from a metal and comprises a plurality of channels extending the length of the body.
4. A system according to claim 2, wherein the body comprises an internal tube that defines the internal space for receiving the stationary batch of material for chilling/freezing and an external shell formed over said internal tube to form the at least one channel therebetween.
5. A system according to claim 2 or claim 3, wherein an inlet manifold is attached

- to an inlet end of the at least one module, the inlet manifold having at least one inlet for introducing the heat exchange medium into the at least one channel and being controllable to introduce the material to be frozen/chilled into the internal space of the body.
6. A system according to claim 5, wherein the inlet manifold includes one or more valve members to control the introduction of the material to be chilled/frozen into the internal space thereof to form the stationary batch of material for freezing/chilling.
 7. A system according to claim 2 or claim 3, wherein an outlet manifold is attached to the outlet, the outlet manifold having at least one outlet for removing a heat exchange medium from the at least one channel and being controllable to receive the at least partially frozen batch of material from the at least one module.
 8. A system according to claim 7, wherein the outlet manifold includes cutters, guillotines, and/or robotic handling systems to receive and process the at least partially frozen batch of material into predetermined sizes.
 9. A system according to any of claims 1 - 8, wherein the system comprises multiple modules arranged in parallel and the modules are controlled to operate at different cycles.
 10. A method for freezing/chilling materials, comprising:
 - collecting the materials to be frozen/chilled;
 - delivering the materials to a module whereby the materials are caused to flow into the module to substantially fill the module to form a stationary batch of material for freezing/chilling;
 - introducing a refrigerant heat exchange medium into the module to cause the stationary batch of material present therein to form an least partially frozen batch of material;
 - after a predetermined time, introducing a defrost heat exchange medium into the module to replace the refrigerant heat exchange medium to cause the at least partially frozen batch of material at the interface of the module to at least partially melt;
 - applying a positive pressure to the module to cause the at least partially frozen batch of material present in the module to be expelled out of the module;
 - and
 - collecting the at least partially frozen batch of material expelled from the module for further processing.
 11. A method according to claim 10, wherein the at least partially frozen batch of

material is collected in a collection hopper for processing.

12. A method according to claim 10, wherein the materials are delivered to the module under pressure so as to flow into the module to substantially fill the module.
13. A method according to claim 12, wherein the materials are delivered to the module under pressure supplied by a pump.
14. A method according to claim 12, wherein the module comprises an elongated space into which the materials are delivered to form the stationary batch of material for freezing/chilling and the materials flow into the elongated space such that the stationary batch of material for freezing/chilling substantially fills the elongated space.
15. A method according to claim 14, wherein the module comprises one or more channels configured to extend along the elongated space such that the refrigerant heat exchange medium is introduced into the one or more channels to cause the stationary batch of material present in the elongate channel to at least partially freeze.
16. A method according to claim 15, wherein after the predetermined time period, the refrigerant heat exchange medium in the one or more channels is replaced with the defrost heat exchange medium such that the stationary batch of material present at the interface of the elongate space is caused to at least partially melt.
17. A method according to claim 10, wherein the positive pressure is applied to the module in the form of pressurised air.
18. A method according to claim 10, wherein the positive pressure is applied to the module by fresh material delivered into the module under pressure to cause the at least partially frozen batch of material present in the module to flow out of the module.
19. A method according to claim 18, wherein the pressure is supplied to the fresh material by a pump.
20. A method according to claim 10, wherein the at least partially frozen batch of material ejected from the module exits the module by way of an exit manifold.
21. A method according to claim 20, wherein the exit manifold comprises cutters, guillotines, and robotic handling systems to receive and process the at least partially frozen batch of material into predetermined sized slabs.

The claims defining the invention are as follows:

- ~~1. A heat exchange module for an in-line freezing/chilling system for freezing/chilling materials, comprising:
a body forming a conduit having:
an internal wall defining an internal space for chilling/freezing materials contained therein, the internal space extending a length of the body; and
an external wall spaced from the internal wall to define at least one channel formed therebetween that extends the length of the body;
an inlet manifold attached to an inlet end of the body to seal the inlet end, the inlet manifold having at least one inlet for introducing a heat exchange medium into the at least one channel and being controllable to introduce the material to be frozen/chilled into the internal space of the body; and
an outlet manifold attached to an outlet end of the body to seal the outlet end, the outlet manifold having at least one outlet for removing a heat exchange medium from the at least one channel and being controllable to receive the frozen/chilled material from the internal space of the body.~~
- ~~2. A heat exchange module according to claim 1, wherein the body is extruded from a metal and comprises a plurality of channels extending the length of the body.~~
- ~~3. A heat exchange module according to claim 1, wherein the body comprises an internal tube that defines the internal space for chilling/freezing materials and an external shell formed over said internal tube to form the at least one channel therebetween.~~
- ~~4. A heat exchange module according to claim 1 or claim 2, wherein the inlet manifold includes one or more valve members to control the introduction of the material to be chilled/frozen into the internal space thereof.~~
- ~~5. A heat exchange module according to claim 1 or claim 2, wherein the outlet manifold includes cutters, guillotines, and/or robotic handling systems to receive and process the chilled/frozen material into predetermined sizes.~~
- ~~6. A heat exchange module according to claim 1, wherein the cross-sectional shape of the body is substantially circular.~~
- ~~7. A heat exchange system according to claim 2, wherein the cross-sectional shape of the body can be any shape.~~
- 8.1. A system for freezing/chilling materials, comprising:
an inlet for receiving the materials;

a pump for applying a positive pressure to the materials to facilitate flow of the materials through the system;

at least one module in fluid communication with the pump to receive the materials and to store the materials therein for a predetermined period of time as a stationary batch of material for freezing/chilling, the at least one module having an internal wall in communication with the stationary batch of materials stored therein that is adapted to apply a low temperature to the materials to at least partially freeze the stationary batch of materials and which is adapted to apply a heat to the at least partially frozen stationary batch of materials to defrost the stationary batch of materials at an interface between the stationary batch of materials and the internal wall; and

an outlet for receiving the at least partially frozen batch of materials from the at least one module;

wherein, the flow of the material is controllable to deliver the material into the at least one module and to stop further flow of the material into the at least one module to form the stationary batch of material within the at least one module, and the flow of the material is further controllable to recommence flow of the material into the at least one module following the defrost to cause the at least partially frozen batch of materials ~~are to be~~ received by the outlet from the at least one module ~~under action of the pump following defrosting of the materials.~~

~~9-2.~~ A system according to claim 1, wherein the at least one module comprises a body forming a conduit and the internal wall defines an internal space formed within the conduit for receiving the stationary batch of material for chilling/freezing, and the body further comprises an external wall spaced from the internal wall to define at least one channel formed therebetween that extends a length of the body to receive a heat exchange medium.

~~10-3.~~ A system according to claim 2, wherein the body is extruded from a metal and comprises a plurality of channels extending the length of the body.

4. A system according to claim 2, wherein the body comprises an internal tube that defines the internal space for receiving the stationary batch of material for chilling/freezing and an external shell formed over said internal tube to form the at least one channel therebetween.

5. A system according to claim 2 or claim 3, wherein an inlet manifold is attached to an inlet end of the at least one module, the inlet manifold having at least one inlet for introducing the heat exchange medium into the at least one channel and being controllable to introduce the material to be frozen/chilled into the internal space of the body.

6. A system according to claim 5, wherein the inlet manifold includes one or more valve members to control the introduction of the material to be chilled/frozen into the internal space thereof to form the stationary batch of material for freezing/chilling.
7. A system according to claim 2 or claim 3, wherein an outlet manifold is attached to the outlet, the outlet manifold having at least one outlet for removing a heat exchange medium from the at least one channel and being controllable to receive the at least partially frozen batch of material from the at least one module.
8. A system according to claim 7, wherein the outlet manifold includes cutters, guillotines, and/or robotic handling systems to receive and process the at least partially frozen batch of material into predetermined sizes.
- ~~11. A system according to claim 1, wherein the at least one module comprises a tube having an outer shell formed thereabout to define a space between the tube and the outer shell to receive a heat exchange medium.~~
- ~~12. A system according to claim 2, wherein the tube receives the materials from the pump.~~
- ~~13-9.~~ A system according to any of claims ~~8-10~~ - 8, wherein the system comprises multiple modules arranged in parallel and the modules are controlled to operate at different cycles.
- ~~14-10.~~ A method for freezing/chilling materials, comprising:
 - collecting the materials to be frozen/chilled;
 - delivering the materials to a module whereby the materials are caused to flow into the module to substantially fill the module to form a stationary batch of material for freezing/chilling;
 - introducing a refrigerant heat exchange medium into the module to cause the stationary batch of material/materials present therein to at least partially frozen batch of material/freeze;
 - after a predetermined time, introducing a defrost heat exchange medium into the module to replace the refrigerant heat exchange medium to cause the at least partially frozen batch of material at the interface of the module to at least partially melt;
 - ~~delivering fresh material into~~ applying a positive pressure to the module to cause the at least partially frozen batch of material present in the module to flow out/be expelled out of the module to be replaced by the fresh material; and
 - collecting the at least partially frozen batch of material flowing out of the expelled from the module for further processing.
- ~~15-11.~~ A method according to claim ~~12~~10, wherein the at least partially frozen batch of materials are/is collected in a collection hopper for processing.
- ~~16-12.~~ A method according to claim ~~13~~10, wherein the materials are delivered to the module under pressure so as to flow into the module to substantially fill the module.

- ~~17-13.~~ A method according to claim ~~14~~12, wherein the materials are delivered to the module under pressure supplied by a pump.
- ~~18-14.~~ A method according to claim ~~15~~12, wherein the module comprises an elongated space into which the materials are delivered to form the stationary batch of material for freezing/chilling and the materials flow into the elongated space ~~so~~ such that the stationary batch of material for freezing/chilling substantially fills the elongated space.
- ~~19-15.~~ A method according to claim ~~16~~14, wherein the module comprises one or more channels configured to extend along the elongated space such that the refrigerant heat exchange medium is introduced into the one or more channels to cause the stationary batch of material ~~material~~-present in the elongate channel to at least partially freeze.
- ~~20-16.~~ A method according to claim ~~17~~15, wherein after the predetermined time period, the refrigerant heat exchange medium in the one or more channels is replaced with the defrost heat exchange medium such that the stationary batch of material ~~material~~-present at the interface of the elongate space is caused to at least partially melt.
- ~~17.~~ A method according to claim 10, wherein the positive pressure is applied to the module in the form of pressurised air.
- ~~21-18.~~ A method according to claim ~~12~~10, wherein the positive pressure is applied to the module by fresh material ~~is delivered~~ into the module under pressure to cause the at least partially frozen batch of material present in the module to flow out of the module.
- ~~22-19.~~ A method according to claim ~~19~~18, wherein the pressure is supplied to the fresh material by a pump.
- ~~23-20.~~ A method according to claim ~~12~~10, wherein the at least partially frozen batch of material ~~flowing-ejected~~ from the module exits the module by way of an exit manifold.
- ~~24-21.~~ A method according to claim ~~20~~1, wherein the exit manifold comprises cutters, guillotines, and robotic handling systems to receive and process the at least partially frozen batch of material into predetermined sized slabs, ~~for further processing.~~