CLAIMS:

1. A continuous freeze dryer comprising:

   a. a freeze-drying chamber capable of at least partial evacuation having a continuous conveyor from an inlet to an outlet, wherein the inlet has an inlet valve; and

   b. a hopper for supplying product to the inlet of the freeze-drying chamber configured to form a sealed coupling with the inlet, wherein the hopper includes a hopper valve allowing the hopper to be sealed and evacuated with a product to be freeze-dried inside,

   wherein, when the hopper is coupled to the chamber, the inlet valve and hopper valve are arranged so that both may be opened to provide a pathway between the hopper and the chamber whilst the hopper and chamber are maintained in an evacuated condition.

2. A continuous freeze dryer as claimed in claim 1 wherein an evacuation port for evacuating fluid from the hopper is coupled to the hopper when the hopper is coupled to the freeze dryer inlet to facilitate evacuation of the hopper.

3. A continuous freeze dryer as claimed in claim 2 wherein the hopper is of dual wall construction having spaced apart inner and outer walls with passages between the volume between the walls and the interior of the hopper.

4. A continuous freeze dryer as claimed in claim 3 wherein the evacuation port is coupled to the volume between the walls of the hopper.

5. A continuous freeze dryer as claimed in any one of the preceding claims wherein the hopper valve is a cone valve.

6. A continuous freeze dryer as claimed in any one of the preceding claims arranged for a linear actuator to be extended to open the inlet valve and hopper valve.

7. A continuous freeze dryer as claimed in any one of the preceding claims including a plurality of stacked trays arranged to move sequentially from the top to the bottom of the chamber during freeze-drying.

8. A continuous freeze dryer as claimed in claim 7 wherein the bottom tray is arranged to be tipped to deliver processed product to the chamber outlet and then positioned as the top tray.

9. A continuous freeze dryer as claimed in claim 7 or claim 8 including a feeder arranged to distribute product evenly across the top tray.

10. A continuous freeze dryer as claimed in any one of ~~the preceding claims~~claims 7 to 9 including radiating elements positioned above the trays of each level to provide required heating.

11. A continuous freeze dryer as claimed in 10 wherein the radiating elements are controllable to create a temperature gradient that decreases from the top to the bottom.

12. A continuous freeze dryer as claimed in any one of the preceding claims including a plurality of condensers within the chamber arranged to remove moisture from the chamber.

13. A continuous freeze dryer as claimed in claim 12 wherein each condenser is located in a bay that arranged for selective isolation to effect defrosting.

14. A continuous freeze dryer as claimed in claim 13 wherein each condenser is arranged for sequential isolation by a screen arranged to sequentially move across to seal each bay.

15. A continuous freeze dryer as claimed in any one of the preceding claims wherein the outlet includes a butterfly valve arranged to control the flow of product via the outlet.

16. A continuous freeze-drying method using an evacuated freeze-drying chamber having an inlet and an outlet, the method comprising the steps of:

    a. loading product into a hopper;

    b. coupling the hopper with the inlet of the freeze-drying chamber;

    c. evacuating the hopper;

    d. opening a pathway between the hopper and the inlet to allow product to enter the evacuated freeze-drying chamber; and

    e. conveying the product through and freeze-drying the product in the freeze-drying chamber.

17. A continuous freeze-drying method as claimed in claim 16 comprising the further steps of:

    a. coupling an evacuated receptacle to the outlet and opening a pathway between the freeze-drying chamber outlet and the receptacle; and

    b. transferring processed product to the receptacle through the outlet.

18. A method as claimed in claim 16 or claim 17 wherein the inlet includes an inlet valve and the hopper includes a hopper valve and both valves are opened to create a pathway between the hopper and the inlet.

19. A method as claimed in any one of claims 16 to 18 wherein after product is supplied to the inlet the pathway between the freeze-drying chamber outlet and the receptacle is closed, the hopper is repressurised to atmospheric pressure and the hopper is removed.

20. A method as claimed in any one of claims 16 to 19 wherein the product is heated according to a reducing temperature profile from the inlet to the outlet.