CLAIMS

1. A dispensing system comprising:

a powder source configured to store powder to be dispensed over a top surface of a platen;

an array of nozzles coupled to the powder source, the array of nozzles positioned in an arrangement that, in combination, continuously spans at least a portion of width of the top surface, each nozzle providing a respective path for the powder to flow from the powder source to the top surface of the platen; and

an array of powder wheels, each powder wheel being positioned in a respective path of a nozzle and being connected to a respective motor, each powder wheel having a plurality of troughs on surface of the powder wheel, the troughs configured to deliver the powder from the powder source to the top surface through the respective path when the powder wheel is rotated by the motor,

wherein the dispensing system is a component of an additive manufacturing apparatus configured to form an object from the powder on the platen.

2. The dispensing system of claim 1, wherein powder source is a hopper that includes a paddle wheel or agitator along width of the powder source, the paddle wheel or agitator configured to distribute the powder uniformly across the nozzles.

3. The dispensing system of claim 2, wherein the paddle wheel or agitator has adjustable rotation speed.

4. The dispensing system of claim 1, wherein the powder source includes a load cell configured to detect powder level in the powder source and provide the powder level to a display device or a control device.

5. The dispensing system of claim 1, wherein the nozzles are arranged in a single row or a plurality of staggering rows, the nozzles being positioned at base of the powder source.

6. The dispensing system of claim 1, wherein the array of nozzles is one array of a plurality of arrays of nozzles that are aligned along length of the top surface of the platen.

7. The dispensing system of claim 1, comprising a pitch adjuster configured to adjust a pitch of the array of nozzles.

8. The dispensing system of claim 1, comprising a height adjuster configured to adjust a distance between openings of the nozzles to the top surface.

9. The dispensing system of claim 1, wherein:
each trough on each powder delivering wheel is parallel to an axis of the wheel, and
openings of the nozzles are circles, rectangles, triangles or elongated slots.

10. The dispensing system of claim 1, wherein each powder wheel is positioned between an inlet and an outlet of a respective nozzle.

11. The dispensing system of claim 1, wherein each motor is a stepper motor driven by a respective stepper driver circuit, each stepper motor having variable rotation speed, wherein adjusting the rotation speed changes a flow rate of the powder.

12. The dispensing system of claim 1, wherein each of the powder wheels is coupled to a tachometer configured to detect a stall condition.

13. The dispensing system of claim 1, comprising a cooling plate mounted on a base of the nozzles and powder source, the cooling plate configured to maintain a constant operating temperature.

14. The dispensing system of claim 1, comprising a roller and blade assembly configured to level powder on the top surface of the platen using the blade assembly and compact the powder on the top surface using the roller.

15. The dispensing system of claim 1, comprising an enclosure housing the powder source, the nozzles and the powder wheels, the enclosure configured to be filled with a circulating inert gas, the inert gas excluding oxygen to below a threshold level.

16. A method of dispensing powder in an additive manufacturing apparatus, the method comprising:
distributing powder uniformly in a powder source of a powder dispensing system across

an array of nozzles coupled to the powder source, the nozzles being positioned in an arrangement that continuously spans at least a portion of width of a top surface of a platen;

dispensing the powder from the powder source through the nozzles to the top surface, the dispensing including controlling a respective flow rate of the powder through each of the nozzles by a respective powder wheel, wherein each powder wheel is positioned between an inlet and an outlet of a respective nozzle, each powder wheel has a plurality of troughs on surface of the powder wheel, and each powder wheel is coupled to a respective motor;

leveling the powder dispensed on the top surface; and

forming a layer of an object by fusing the leveled powder, wherein forming the layer includes moving the dispensing system across a length of the top surface of the platen.

17. The method of claim 16, wherein dispensing the powder comprises:

rotating a powder wheel to allow the powder to flow from the powder source to the top surface where a portion of the object is solid material; and

stopping a powder wheel to prevent the powder from flowing from the powder source to the top surface where a portion of the object is empty space.

18. The method of claim 16, comprising controlling spatial resolution of the object by adjusting a pitch of the dispensing system.

19. The method of claim 16, comprising cooling the dispensing system by a cooling plate mounted on base of the dispensing system.

20. The method of claim 16, wherein the dispensing system is one among a plurality of dispensing systems of the additive manufacturing apparatus, each of the dispensing systems dispensing a different powder, at least one powder being a metal powder.