Summary

[0005] In one aspect, the present disclosure is directed to an additive manufacturing system. The additive manufacturing system may include a support, and an outlet configured to discharge a material. The outlet may be operatively connected to and moveable by the support in a travel direction during material discharge. The outlet may include a guide, and a compactor operatively connected to the guide at a trailing location relative to the travel direction. The compactor may be moveable to urge the compactor towards the discharging material. The outlet may also include at least one cure enhancer mounted to move with the compactor relative to the guide such that the movement of the compactor results in corresponding movement of the cure enhancer. The at least one cure enhancer may be configured to expose the material to a cure energy.

[0006] There is disclosed another additive manufacturing system. This additive manufacturing system may include a nozzle configured to discharge continuous reinforcement at least partially wetted with a matrix, at least one cure enhancer configured to expose the matrix to a cure energy after discharge from the nozzle, and a compactor configured to apply a pressure to the matrix-wetted continuous reinforcement after discharge from the nozzle. The at least one cure enhancer and the compactor may be mounted to move together relative to the nozzle, in a direction of discharge from the nozzle.

[0007] In yet another aspect, the present disclosure is directed to a method of additively manufacturing a structure. The method may include wetting a continuous reinforcement with a liquid matrix inside of a print head, and discharging the matrix-wetted continuous reinforcement through an outlet of the print head. The method may also include pressing a compactor to urge the compactor against the matrix-wetted continuous reinforcement after discharging, directing cure energy from at least one cure enhancer toward the matrix-wetted continuous reinforcement after pressing, and moving the at least one cure enhancer with the compactor such that the movement of the compactor results in corresponding movement of the cure enhancer.

Brief Description of the Drawings

[0008] Fig. 1 is a diagrammatic illustration of an exemplary disclosed additive manufacturing system; and

[0009] Figs. 2 and 3 are diagrammatic illustrations of exemplary disclosed portions of the system of Fig. 1.

Claims

What is claimed is:

1 . An additive manufacturing system, comprising:

a support; and

an outlet configured to discharge a material and being operatively connected to and moveable by the support in a travel direction during material discharge, the outlet including:

a guide;

a compactor operatively connected to the guide at a trailing location relative to the travel direction, the compactor being moveable to urge the compactor towards the discharging material; and

at least one cure enhancer mounted to move with the compactor relative to the guide such that the movement of the compactor results in corresponding movement of the cure enhancer, the at least one cure enhancer configured to expose the material to a cure energy.

2. The additive manufacturing system of claim 1, wherein the compactor includes:

a compactor bracket mounted to the guide;

a roller; and

an axle rotationally connecting the roller to the compactor bracket.

3. The additive manufacturing system of claim 2, wherein the at least one cure enhancer is operatively mounted to the compactor bracket.

4. The additive manufacturing system of claim 3, wherein the at least one cure enhancer includes at least one optical tube terminating at the compactor bracket and being configured to transmit light energy.

5. The additive manufacturing system of claim 2, wherein the compactor bracket is slidingly disposed within a channel of the guide.

6. the additive manufacturing system of claim 5, further including a cover configured to capture the compactor bracket in the channel.

7. The additive manufacturing system of claim 4, further including a spring configured to bias the compactor in the axial direction of the guide.

8. The additive manufacturing system of claim 7, further including:
a first stud associated with the compactor bracket; and
a second stud associated with the guide,
wherein the spring is configured to pull the first and second studs towards each other.

9. The additive manufacturing system of claim 1, further including a wetting mechanism located upstream of the guide, the wetting mechanism configured to wet a continuous reinforcement with a liquid matrix that is curable by the cure energy.

10. The additive manufacturing system of claim 1, wherein:
the at least one cure enhancer includes a first cure enhancer and a second cure enhancer; and
the first and second cure enhancers are each tilted toward each other at an angle of 5-60° relative to a normal extending through the discharging material at a location of cure energy exposure.

11. The additive manufacturing system of claim 10, wherein the first and second cure enhancers are tilted toward the compactor at an angle of 5-45° relative to a normal extending through the discharging material at the location of cure energy exposure.

12. A method of additively manufacturing a structure, comprising:
wetting a continuous reinforcement with a liquid matrix inside of a print head;
discharging the matrix-wetted continuous reinforcement through an outlet of the print head;
pressing a compactor to urge the compactor against the matrix-wetted continuous reinforcement after discharging;
directing cure energy from at least one cure enhancer toward the matrix-wetted continuous reinforcement after pressing; and

moving the at least one cure enhancer with the compactor such that the movement of the compactor results in corresponding movement of the cure enhancer.

13. The method of claim 12, further including moving the outlet, compactor, and at least one cure enhancer together during discharging.

14. The method of claim 12, wherein:

the at least one cure enhancer includes at least one optical tube; and

the cure energy is light energy.

15. The method of claim 12, wherein directing cure energy from at least one cure enhancer toward the matrix-wetted continuous reinforcement includes:

directing cure energy along a direction of travel at an angle of 5-45°; and

directing cure energy from first and second cure enhancers transversely toward the matrix-wetted continuous reinforcement at an angle of 5-60°.