CLAIMS

What is claimed is:

1. A method of filling a plurality of cooling holes in an airfoil component, the method comprising:

injecting a curable composition into a fill channel such that the curable composition flows through the fill channel to the plurality of cooling holes;

forming a plurality of beads of the curable composition on a surface of the component over the plurality of cooling holes;

directing a radiation to the respective beads in directions parallel to the respective central axes of the cooling holes associated with the respective beads to cure curable composition of the respective beads; and

heating the component to cure the curable composition located in the fill channel; wherein the heating of the component is conducted after the directing of the radiation to the beads; wherein the injecting comprises injecting the curable composition via an injector located in an injection hole in fluid communication with the fill channel; and wherein the method further comprises removing the injector from the injection hole while injecting the curable composition to form a final bead on the injection surface over the injection hole; and curing the curable composition in the final bead.

2. The method of Claim 1, wherein the directing the radiation comprises directing the radiation from a radiation source located on a multi-axis arm being positional about the component and having 6 degrees of freedom.

3. The method of Claim 2, wherein the directing the radiation comprises directing a first radiation to a first bead of a first cooling hole in direction parallel to a first central axis of the first cooling hole; repositioning a multi-axis arm having the radiation source located thereon to a second central axis of a second cooling hole; directing a second radiation to a second bead located on the second cooling hole; and optionally repeating the repositioning of the multi-axis arm to subsequent beads comprising the uncured composition.

4. The method of one or more of Claims 2 to 3, further comprising determining a curing path for the multi-axis arm based on the relative formation of the plurality of beads on the plurality of cooling holes.

5. The method of any one or more of Claims 2 to 4, further comprising determining respective central axes of the cooling holes based on at least one of a three-dimensional diagram of the component or based on a measured axis; and positioning the radiation source based on the determined central axes.

6. The method of any one or more of Claims 2 to 5, wherein the directing the radiation comprises directing multiple multi-axis arms to respective beads comprising the uncured composition.

7. The method of any one or more of the preceding claims, wherein directions parallel to the respective central axes are at angles of 0 to 20°, or 0 to 15°, or 0 to 10°, or 0 to 5° of each of the central axes of the respective cooling holes.

8. The method of any one or more of the preceding claims, wherein the injecting the curable composition comprises injecting the curable composition into at least 2 fill channels, or 2 to 5 fill channels.

9. The method of Claim 8, wherein at least 2 of the fill channels are in fluid communication with each other.

10. The method of any one or more of Claims 8 to 9, wherein at least 2 of the fill channels are not in fluid communication with each other.

11. The method of any one or more of the preceding claims, wherein the directing the radiation on the plurality of beads comprises forming a first bead having a convex shape on the surface of the component and then directing the radiation to the first bead.

12. The method of any one or more of the preceding claims, further comprising filling an unconnected hole that is not in fluid communication with the fill channel with the curable composition.

13. The method of any one or more of the preceding claims, wherein the plurality of cooling holes are in fluid communication with the internal area.

14. The method of any one or more of the preceding claims, comprising filling all of the plurality of cooling holes with the curable composition.

15. The method of any one or more of the preceding claims, wherein the heating the component occurs after directing the radiation to cure the curable composition located in the fill channel.

16. A method of filling a plurality of cooling holes in an airfoil component, the method comprising:

injecting a curable composition into a fill channel such that the curable composition flows through the fill channel to the plurality of cooling holes to form a plurality of beads of the curable composition on a surface of the component over the plurality of cooling holes;

filling any unconnected holes not in fluid communication with the fill channel with the curable composition;

directing a radiation from a radiation source located on a multi-axis arm being positional about the component and having 6 degrees of freedom to the respective beads in directions parallel to the respective central axes of the cooling holes associated with the respective beads to cure curable composition of the respective beads; wherein the directions parallel to the respective central axes are at angles of 0 to 20°, or 0 to 15°, or 0 to 10°, or 0 to 5° of each of the central axes of the respective cooling holes; and

heating the component after directing the radiation to cure the curable composition located in the fill channel; wherein the heating of the component is conducted after the directing of the radiation to the beads; wherein the injecting comprises injecting the curable composition via an injector located in an injection hole in fluid communication with the fill channel; and wherein the method further comprises removing the injector from the injection hole while injecting the curable composition to form a final bead on the injection surface over the injection hole; and curing the curable composition in the final bead.