CLAIMS:

1. A coating system comprising:

a planetary manipulator assembly comprising:

a first driveshaft capable of receiving rotational input;

a sun gear rotationally fixed to the first driveshaft for rotation therewith;

a planetary gear engaged with the sun gear;

a second driveshaft rotationally fixed to the planetary gear for rotation therewith, such that torque is transmitted from the sun gear to the planetary gear to rotate the second driveshaft;

a support shaft operatively engaged with the second driveshaft, wherein the support shaft is arranged substantially perpendicular to the second driveshaft;

a carrier body supporting the planetary gear relative to the sun gear, wherein the carrier body is rotatable about a common axis with the sun gear, and wherein rotation of the carrier body rotates the planetary gear and the second driveshaft about the sun gear;

a third driveshaft capable of receiving rotational input; and

a drive gear rotationally fixed to the third driveshaft for rotation therewith, wherein rotation of the drive gear rotates the carrier body; and

a coating source positioned in operative proximity to the coating manipulator.

2. The system of claim 1, wherein the first driveshaft and the second driveshaft are arranged parallel to each other.

3. The system of claim 1, wherein the first driveshaft and the third driveshaft are arranged parallel to each other.

4. The system of claim 1 and further comprising:

a carrier gear rotationally fixed to the carrier body and engaged with the drive gear.

5. The system of claim 4, wherein the carrier gear is rotationally supported on the first driveshaft and capable of rotation independent of the first driveshaft.

6. The system of claim 1 and further comprising:

bevel gears that provide a rotational engagement between the second driveshaft and the support shaft.

7. The system of claim 1 and further comprising:

a workpiece support fixture secured to the support shaft.

8. The system of claim 7 and further comprising:

a gas turbine engine vane segment workpiece having a pair of airfoils extending between an inner platform and an outer platform, wherein the fixture supports the vane segment workpiece with the support shaft of the planetary manipulator assembly positioned at a midpoint located in between the airfoils and in between the inner and outer platforms.

9. The system of claim 1 and further comprising:

a manipulator housing for shielding components of the planetary manipulator assembly from coating material from the coating source.

10. The system of claim 1, wherein the coating source comprises an electron beam physical vapor deposition assembly.

11. A method of manipulating a workpiece for coating application, the method comprising:

rotating a sun gear about a first axis;

rotating a planetary gear and associated shaft using the sun gear;

rotating a support shaft using the planetary gear and the associated shaft, wherein the support shaft rotates about a second axis that is perpendicular to the first axis;

rotating a carrier body to move the planetary gear and the associated shaft about a circumference of the sun gear;

carrying a workpiece at a distal end of the support shaft; and

delivering a coating material to the workpiece.

12. The method of claim 11, wherein the coating material is delivered in a direction substantially perpendicular to the first axis.

13. A coating system comprising:

a planetary manipulator assembly comprising:

a first driveshaft capable of receiving rotational input;

a sun gear rotationally fixed to the first driveshaft for rotation therewith;

a planetary gear engaged with the sun gear;

a second driveshaft rotationally fixed to the planetary gear for rotation therewith, such that such that torque is transmitted from the sun gear to the planetary gear to rotate the second driveshaft, wherein the first driveshaft and the second driveshaft are arranged parallel to each other;

a support shaft operatively engaged with the second driveshaft, wherein the support shaft is arranged substantially perpendicular to the second driveshaft;

bevel gears that provide a rotational engagement between the second driveshaft and the support shaft;

a carrier body supporting the planetary gear relative to the sun gear, wherein the carrier body is rotatable about a common axis with the sun gear, and wherein rotation of the carrier body rotates the planetary gear and the second driveshaft about the sun gear;

a third driveshaft capable of receiving rotational input, wherein the first driveshaft and the third driveshaft are arranged parallel to each other;

a drive gear rotationally fixed to the third driveshaft for rotation therewith, wherein rotation of the drive gear rotates the carrier body; and

a carrier gear rotationally fixed to the carrier body and engaged with the drive gear; and

a coating source positioned in operative proximity to the coating manipulator.

14. The system of claim 13, wherein the carrier gear is rotationally supported on the first driveshaft and capable of rotation independent of the first driveshaft.

15. The system of claim 13 and further comprising:

a workpiece support fixture secured to the support shaft.

16. The system of claim 15 and further comprising:

a gas turbine engine vane segment workpiece having a pair of airfoils extending between an inner platform and an outer platform, wherein the fixture supports the vane segment workpiece with the support shaft of the planetary manipulator assembly positioned at a midpoint located in between the airfoils and in between the inner and outer platforms.

17. The system of claim 13 and further comprising:

a manipulator housing for shielding components of the planetary manipulator assembly from coating material from the coating source.

18. The system of claim 13, wherein the coating source comprises an electron beam physical vapor deposition assembly.

CLAIMS

1. A coating system comprising:

a planetary manipulator assembly comprising:

a first driveshaft capable of receiving rotational input;

a sun gear rotationally fixed to the first driveshaft for rotation therewith;

a planetary gear engaged with the sun gear;

a second driveshaft rotationally fixed to the planetary gear for rotation therewith, such that torque is transmitted from the sun gear to the planetary gear to rotate the second driveshaft;

a support shaft operatively engaged with the second driveshaft, wherein the support shaft is arranged substantially perpendicular to the second driveshaft;

a carrier body supporting the planetary gear relative to the sun gear, wherein the carrier body is rotatable about a common axis with the sun gear, and wherein rotation of the carrier body rotates the planetary gear and the second driveshaft about the sun gear;

a third driveshaft capable of receiving rotational input; and

a drive gear rotationally fixed to the third driveshaft for rotation therewith, wherein rotation of the drive gear rotates the carrier body; and

a coating source positioned in operative proximity to the planetary manipulator assembly.

2. The system of claim 1, wherein the first driveshaft and the second driveshaft are arranged parallel to each other.

3. The system of claim 1, wherein the first driveshaft and the third driveshaft are arranged parallel to each other.

4. The system of claim 1 and further comprising:

a carrier gear rotationally fixed to the carrier body and engaged with the drive gear.

5. The system of claim 4, wherein the carrier gear is rotationally supported on the first driveshaft and capable of rotation independent of the first driveshaft.

6. The system of claim 1 and further comprising:

bevel gears that provide a rotational engagement between the second driveshaft and the support shaft.

7. The system of claim 1 and further comprising:

a workpiece support fixture secured to the support shaft.

8. The system of claim 7 and further comprising:

a gas turbine engine vane segment workpiece having a pair of airfoils extending between an inner platform and an outer platform, wherein the fixture supports the vane segment workpiece with the support shaft of the planetary manipulator assembly positioned at a midpoint located in between the airfoils and in between the inner and outer platforms.

9. The system of claim 1 and further comprising:

a manipulator housing for shielding components of the planetary manipulator assembly from coating material from the coating source.

10. The system of claim 1, wherein the coating source comprises an electron beam physical vapor deposition assembly.

11. A method of manipulating a workpiece for coating application, the method comprising:

rotating a sun gear about a first axis;

rotating a planetary gear and associated shaft using the sun gear;

rotating a support shaft using the planetary gear and the associated shaft, wherein the support shaft rotates about a second axis that is perpendicular to the first axis;

rotating a carrier body to move the planetary gear and the associated shaft about a circumference of the sun gear;

carrying a workpiece at a distal end of the support shaft; and

delivering a coating material to the workpiece.

12. The method of claim 11, wherein the coating material is delivered in a direction substantially perpendicular to the first axis.

13. A coating system comprising:

a planetary manipulator assembly comprising:

a first driveshaft capable of receiving rotational input;

a sun gear rotationally fixed to the first driveshaft for rotation therewith;

a planetary gear engaged with the sun gear;

a second driveshaft rotationally fixed to the planetary gear for rotation therewith, such that such that torque is transmitted from the sun gear to the planetary gear to rotate the second driveshaft, wherein the first driveshaft and the second driveshaft are arranged parallel to each other;

a support shaft operatively engaged with the second driveshaft, wherein the support shaft is arranged substantially perpendicular to the second driveshaft;

bevel gears that provide a rotational engagement between the second driveshaft and the support shaft;

a carrier body supporting the planetary gear relative to the sun gear, wherein the carrier body is rotatable about a common axis with the sun gear, and wherein rotation of the carrier body rotates the planetary gear and the second driveshaft about the sun gear;

a third driveshaft capable of receiving rotational input, wherein the first driveshaft and the third driveshaft are arranged parallel to each other;

a drive gear rotationally fixed to the third driveshaft for rotation therewith, wherein rotation of the drive gear rotates the carrier body; and

a carrier gear rotationally fixed to the carrier body and engaged with the drive gear; and

a coating source positioned in operative proximity to the planetary manipulator assembly.

14. The system of claim 13, wherein the carrier gear is rotationally supported on the first driveshaft and capable of rotation independent of the first driveshaft.

15. The system of claim 13 and further comprising:

a workpiece support fixture secured to the support shaft.

16. The system of claim 15 and further comprising:

a gas turbine engine vane segment workpiece having a pair of airfoils extending between an inner platform and an outer platform, wherein the fixture supports the vane segment workpiece with the support shaft of the planetary manipulator assembly positioned at a midpoint located in between the airfoils and in between the inner and outer platforms.

17. The system of claim 13 and further comprising:

a manipulator housing for shielding components of the planetary manipulator assembly from coating material from the coating source.

18. The system of claim 13, wherein the coating source comprises an electron beam physical vapor deposition assembly.