Claims

What is claimed is:

1. A system for electroplating a workpiece, the workpiece having an interior with a surface, comprising:

an anode having an axis and located in the interior of the workpiece adjacent to the surface and immersed in an electroplating fluid solution;

a centralizer mounted to the anode for centralizing the anode within the interior of the workpiece, the centralizer being electrically non-conductive;

a seal mounted to the anode for retaining the electroplating fluid solution in contact with the anode and the surface of the workpiece;

moving means for moving the anode, centralizer, and seal through the interior at a controlled rate; and

an electrical power supply electrically connected to the anode and the workpiece for supplying a voltage to the anode, through the electroplating fluid solution, and to the workpiece to plate the surface with the electroplating fluid solution.

2. A system according to Claim 1, wherein the surface is a cylindrical bore, the centralizer comprises non-conductive, circular guide disks located on opposite axial ends of the anode for radially aligning the anode within the cylindrical bore, and the anode is cylindrical.

3. A system according to Claim 1, wherein the seal comprises a seal plate mounted to the anode and a lower portion of the centralizer, the seal plate being located between a lower end of the anode and the lower portion of the centralizer, and the seal plate having a non-conductive lip seal for retaining the electroplating fluid solution in contact with the anode and the surface of the workpiece.

4. A system according to Claim 1, wherein the moving means comprises a lifting connection rigidly connected to an outer portion of the centralizer for providing an attachment

point to connect a pulling cable having an opposite end connected to a drum reel, such that the moving means moves the anode, centralizer, and seal through the interior at a controlled rate for continuously plating the surface of the workpiece.

5. A system according to Claim 1, wherein the electrical power supply comprises DC power for supplying a positive charge to a terminal post on the anode via a cable lead, and a negative charge to a terminal post on the workpiece via another cable lead, such that material is plated onto the surface at a rate that is dependent on the DC power, a concentration of the electroplating fluid solution, and a rate of movement of the anode through the workpiece.

6. A system according to Claim 1, wherein the anode is continuously moved through the workpiece at a controlled, predetermined rate so that a uniform plating thickness is obtained on the surface over an entire length of the workpiece.

7. A system for electroplating a workpiece, the workpiece having an exterior with a surface, comprising:

a tank of electroplating fluid solution surrounding a portion of the surface of the workpiece, the tank having a centralizer extending inward therefrom;

an anode mounted to the centralizer and located external to the workpiece adjacent to the surface and immersed in the electroplating fluid solution, such that the anode is centralized with respect to the surface;

a seal mounted to the tank for retaining the electroplating fluid solution in contact with the anode and the surface of the workpiece;

moving means mounted to the tank for moving the tank, anode, centralizer, and seal along the workpiece at a controlled rate; and

an electrical power supply electrically connected to the anode and the workpiece for supplying a voltage to the anode, through the electroplating fluid solution, and to the workpiece to plate the surface with the electroplating fluid solution.

8. A system according to Claim 7, wherein the surface is cylindrical, the centralizer comprises a non-conductive circular guide disk located adjacent an axial center of the tank for radially aligning the anode within the tank with respect to the cylindrical surface, and the anode is cylindrical.

9. A system according to Claim 7, wherein the seal comprises a set of non-conductive flanged seal plates with lip seals located at respective axial ends of the tank, the lip seals forming low pressure seals between the tank and the workpiece to retain the electroplating fluid solution in the tank.

10. A system according to Claim 9, wherein the set of flanged seal plates comprise a plurality of flanged seal plates of various sizes that are used to accommodate workpieces having different diameters.

11. A system according to Claim 7, wherein the moving means comprises a set of support wheels rigidly secured to the tank but allowed to freely rotate, a drive motor coupled to at least one of the support wheels to control a rate of movement of the tank and anode along an axial length of the workpiece for continuously plating the workpiece.

12. A system according to Claim 7, wherein the electrical power supply comprises DC power for supplying a positive charge to the anode via a cable lead, and a negative charge to the workpiece via another cable lead, such that material is plated onto the surface at a rate that is dependent on the DC power, a concentration of the electroplating fluid solution, and a rate of movement of the anode relative to the workpiece.

13. A system according to Claim 7, wherein the tank has a fill port on an upper end thereof for adding additional electroplating fluid solution and monitoring a fluid level of the electroplating fluid solution inside the tank.

14. A system according to Claim 7, further comprising extensions installed on each axial end of the workpiece for plater run out, such that the tank is allowed to smoothly travel beyond the axial ends of the workpiece to plate an entirety of the surface of the workpiece.

15. A system according to Claim 7, wherein the anode is continuously moved along the workpiece at a controlled, predetermined rate so that a uniform plating thickness is obtained on the surface over an entire length of the workpiece.

In the Claims:

1. A system for electroplating a workpiece, the workpiece having an interior with a surface, comprising:

an anode having an axis and configured to be located in the interior of the workpiece adjacent to the surface and immersed in an electroplating fluid solution;

a centralizer mounted to the anode for centralizing the anode within the interior of the workpiece, the centralizer being electrically non-conductive;

a seal mounted to the anode for retaining the electroplating fluid solution in contact with the anode and the surface of the workpiece, wherein the seal is in sealing engagement with the surface of the workpiece while the anode and seal move through the interior of the workpiece;

a cable wrapped around a drum reel and operatively coupled to the anode,

centralizer, and seal for moving the anode, centralizer, and seal through the interior at a controlled rate; a

an electrical power supply electrically connected via a first wire leading to the anode and a second wire to the workpiece for supplying a voltage to the anode, through the electroplating fluid solution, and to the workpiece to plate the surface with the electroplating fluid solution;

and

wherein the wire is spaced apart from the cable.

2. A system according to Claim 1, wherein the surface is a cylindrical bore, the centralizer comprises non-conductive, circular guide disks located on opposite axial ends of the anode for radially aligning the anode within the cylindrical bore, and the anode is cylindrical.

3. A system according to Claim 1, wherein the seal comprises a seal plate mounted to the anode and a lower portion of the centralizer, the seal plate being located between a lower end of the anode and the lower portion of the centralizer, and a non-conductive lip seal extending around a circumference of the seal plate for retaining the electroplating fluid solution in contact with the anode and the surface of the workpiece.

4. A system according to Claim_4-3, wherein t the lip seal has an inner wall and an outer wall joined at a base, defining a generally U-shaped configuration with the walls extending upward from the base, the inner wall being joined to the seal plate and the outer wall adapted to engage the cylindrical bore of the workpiece.

5. A system according to Claim 1, wherein:

the centralizer comprises an upper disk above the anode and a lower disk below the anode; the cable secures to a lifting connection mounted to the upper disk on the axis of the anode, and

the first wire extends through. an opening in the upper disk to the anode, the opening being offset from the lifting connection.

6. A system according to Claim 1, wherein the anode is continuously moved through the workpiece at a controlled, predetermined rate so that a uniform plating thickness is obtained on the surface over an entire length of the

workpiece.

7. A system for electroplating a cylindrical wall of a bore of an offshore platform tensioner, comprising:

an anode having an axis and configured to be lowered into the bore of the tensioner, and immersed in an electroplating fluid solution;

an upper centralizer disk mounted to an upper end of the anode;

a lower centralizer disk mounted to a lower end of the anode, the upper and lower centralizer disks having diameters larger the anode for centralizing the anode within the bore of the tensioner, the upper and lower centralizer disks being electrically non-conductive;

a seal plate mounted between the lower end of the anode and the lower centralizer disk, the seal plate having a diameter smaller than the upper and lower centralizer disks;

a lip seal mounted to a circumference of the seal plate, the lip seal having a diameter larger than the upper and lower centralizer disks for sealing engagement with the wall of the bore of the tensioner;

a cable wrapped around a drum reel and operatively coupled to the upper centralizer disk for lowering and raising the anode within the bore of the tensioner at a controlled rate;

the lip seal adapted to maintain a seal with the bore of the wall of the tensioner while the drum reel moves the anode within the bore of the tensioner;

and

an electrical power supply electrically connected to the anode and to the tensioner for supplying a voltage to the anode and through the electroplating fluid solution to plate the wall of the bore with the electroplating fluid solution.

8. The system according to Claim 7, wherein the lip seal has an inner wall and an outer wall joined at a base, defining a generally U-shaped configuration with the walls extending upward from the base, the inner wall being joined to the seal plate and the outer wall adapted to engage the wall of the bore of the tensioner.

9. A system for electroplating a cylindrical wall of a bore of an offshore platform tensioner, comprising:

an anode having an axis and configured to be lowered into the bore of the tensioner and immersed in an electroplating fluid solution;

an upper centralizer disk mounted to an upper end of the anode;

a lower centralizer disk mounted to a lower end of the anode, the upper and lower centralizer disks having diameters larger the anode for centralizing the anode within the bore of the tensioner, the upper and lower centralizer disks being electrically non-conductive;

a seal plate mounted between the lower end of the anode and the lower centralizer disk, the seal plate having a diameter smaller than the upper and lower centralizer disks;

a lip seal mounted to a circumference of the seal plate, the lip seal

having a diameter

larger than the upper and lower centralizer disks for sealing engagement with the wall of the

bore of the tensioner;

a cable wrapped around a drum reel and coupled to the upper

centralizer disk on the axis of the anode for lowering and raising the anode

within the bore of the tensioner at a

controlled rate;

the lip seal adapted to maintain a seal with the bore of the wall of the

tensioner while the drum reel moves the anode within the bore of the tensioner;

an electrical power supply electrically connected to the anode via a

first wire and to the tensioner via a second wire for supplying a voltage to the

anode and through the electroplating fluid solution to plate the wall of the

bore with the electroplating fluid solution; and

wherein the first wire is separate from and extends alongside the cable through an

opening in the upper centralizer disk to the anode, the opening being offset

from the axis of the anode.