CLAIMS

WHAT IS CLAIMED IS

1. A repaired flange bolt hole comprising:

a flange (10) defining a flange bolt hole (30) having a surface, the flange comprising abase material (12),

a coating system (20) disposed over the surface of the flange bolt hole (30),

wherein the coating system (20) comprises a corrosion resistant layer (16), wherein the corrosion resistant layer (16) comprises a different material than the base material (12),

characterized in that the coating system (20) further comprises an aluminum layer (22) disposed beneath the corrosion resistant layer (16), said aluminum layer (22) configured to be disposed along a surface (14) of the base material (12) as a slurry or using a sol-gel process during repair of the flange bolt hole.

2. The repaired flange bolt hole according to claim 1, wherein the corrosion resistant layer (16) comprises a nickel super alloy, super austenitic stainless steel, or combinations thereof.

3. The repaired flange bolt hole according to claim 1, wherein the corrosion resistant layer (16) comprises a ceramic material.

4. The repaired flange bolt hole according to claim 3, wherein the corrosion resistant layer (16) comprises titania, chromia, alumina, or combinations thereof.

5. The repaired flange bolt hole according to claim 1, wherein the coating system (20) has a thickness of about 10 to about 100 microns.

6. The repaired flange bolt hole according to claim 1, wherein the base material (12) comprises stainless steel.

7. The repaired flange bolt hole according to claim 1, wherein the coating system (20) has a porosity of less than about 5%.

8. The repaired flange bolt hole according to claim 1, wherein the flange bolt hole (30) comprises a circular opening with a depth and a diameter and is disposed along a high pressure compressor in a gas turbine engine.

9. A method of repairing a flange bolt hole, the flange bolt hole (30) having a surface and comprising a base material (12), the method comprising:

reaming the flange bolt hole (30) to remove corroded material (34) in the flange bolt hole (30), and

applying a coating system (20) to the surface of the flange bolt hole (30),

wherein the coating system (20) comprises a corrosion resistant layer (16) that comprises a different material than the base material (12), and

characterized in that applying the coating system to the surface of the flange bolt hole (30) comprises applying an aluminum slurry to the surface of the flange bolt hole (30) forming an aluminum layer (22) disposed beneath the corrosion resistant layer (16).

10. The method according to claim 9, wherein the corrosion resistant layer (16) comprises a nickel super alloy, super austenitic stainless steel, or a ceramic material.

11. The method according to claim 10, wherein the corrosion resistant layer (16) comprises titania, chromia, alumina, or combinations thereof.

12. The method according to claim 9, wherein applying the coating system (20) to the flange bolt hole (30) comprises resistance welding a plug (32) comprising a corrosion resistant material to the surface of the flange bolt hole (30) and drilling a hole in the plug (32) to reform the flange bolt hole (30) with the corrosion resistant layer (16) disposed on the surface.

13. The method according to claim 9, wherein applying the coating system (20) to the flange bolt hole (30) comprises applying the coating system (20) as a slurry, by a sol-gel process, by thermal spray, by cold spray, or combinations thereof.