CLAIMS:

1. A stud welding system, comprising:

a power supply configured to perform a stud welding process and at least one other welding process, the power supply comprising control circuitry for executing the stud welding process and the at least one other welding process, and power conversion circuitry configured to output power suitable for a selected one of the welding processes;

a stud welding gun configured to receive the output power from the power supply and to perform a stud welding process of studs to a workpiece.

2. The system of claim 1, wherein the stud welding gun comprises control circuitry for controlling movement of studs to the workpiece in a single direction without retraction of the studs during the stud welding process.

3. The system of claim 1, wherein the stud welding gun comprises an orientation sensor for detecting an angular orientation of the welding gun and/or a stud loaded in the welding gun for welding to the workpiece.

4. The system of claim 3, wherein the stud welding gun comprises a readout configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

5. The system of claim 3, wherein the stud welding gun comprises a light display configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

6. The system of claim 1, wherein the stud welding gun comprises a nozzle or standoff configured to space a stud to be welded at a desired location with respect to the workpiece and to automatically sense and/or control the spacing.

7. The system of claim 1, wherein the power supply is configured to perform stud welding based upon a pulsed welding regime.

8. The system of claim 1, wherein the stud welding gun is coupled to an automation system for positioning the stud welding gun at a desired location and orientation for welding of studs to the workpiece.

9. A stud welding gun, comprising:

control circuitry configured to control a stud welding process;

an orientation sensor for detecting a position and/or orientation of the welding gun and/or a stud charged in the welding gun for welding to a workpiece.

10. The stud welding gun of claim 9, comprising a readout configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

11. The stud welding gun of claim 9, comprising a light display configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

12. The stud welding gun of claim 9, comprising a nozzle or standoff configured to space a stud to be welded at a desired location with respect to the workpiece.

13. The stud welding gun of claim 9, wherein the control circuitry is configured to automatically initiate an arc for welding of the stud upon detection of a desired position and/or orientation of the welding gun and/or stud.

14. A stud for use in stud welding, comprising:

a body;

an arc-initiating extension from a lower surface of the body, the extension being configured to contact or come into close proximity with a workpiece for initiation of a welding arc in a process of welding the stud to the workpiece.

15. The stud of claim 14, wherein the arc-initiating extension comprises a bridge wire.

16. The stud of claim 15, wherein the bridge wire has a size substantially smaller in cross sectional area than the body of the stud.

17. The stud of claim 15, wherein the bridge wire has a sharpened lower extremity.

18. The stud of claim 14, wherein the arc-initiating extension is centered with respect to the lower surface of the body.

19. The stud of claim 14, wherein the arc-initiating extension is fitted into a recess formed in the body.

20. The stud of claim 14, wherein the arc-initiating extension is made of a material different from the body.

21. The stud of claim 14, wherein the arc-initiating extension is disposed at a periphery of the lower surface of the body.

22. The stud of claim 14, wherein the stud does not comprise a ferrule.

23. A stud delivery device, comprising:

a support; and

a plurality of studs secured to the support in generally parallel or in-line fashion, the studs and support being configured for delivery in serial fashion to a stud welding gun.

24. The stud delivery device of claim 23, wherein the support comprises a tape.

25. The stud delivery device of claim 23, wherein the support comprises a magazine.

26. A method for stud welding, comprising:

loading a stud in a stud welding gun, the stud having a body and an arc-initiating extension;

positioning the stud welding gun at a desired location with respect to a workpiece with the arc-initiating extension contacting or closely proximate the workpiece;

initiating a welding arc between the arc-initiating extension and the workpiece;

holding the stud away from the workpiece for a desired time while maintaining the arc between the stud and the workpiece; and

advancing the stud to the workpiece to join the stud to the workpiece.

27. The method of claim 26, comprising detecting a position and/or orientation of the stud welding gun and/or the stud.

28. The method of claim 27, comprising displaying a user viewable indication of the position and/or orientation of the stud welding gun and/or the stud.

29. The method of claim 27, comprising automatically initiating the welding arc when the position and/or orientation of the stud welding gun and/or the stud reach a desired position and/or orientation.

30. The method of claim 26, wherein the stud welding gun is positioned at the desired location by an automated system.

31. The method of claim 26, comprising applying a first current to the stud to initiate the arc, then applying a second, lower current to the stud following initiation of the arc.

32. The method of claim 31, wherein the first current is higher than about 400 A.

33. The method of claim 32, wherein the first current is applied at a high frequency to initiate the arc.

34. The method of claim 31, wherein the second current is lower than about 400 A.

35. The method of claim 34, comprising applying a current to the arc at less than about 100 A.

36. The method of claim 26, comprising advancing the stud to a desired proximity to the workpiece following initiation of the arc and before or during the step of holding the stud away from the workpiece.

37. The method of claim 26, wherein the stud is advanced at a slow rate following initiation of the arc.

38. The method of claim 26, comprising applying a shielding gas around the stud.

39. The method of claim 38, comprising confining the shielding gas via a nozzle or standoff of the stud welding gun.

40. The method of claim 26, wherein the arc is initiated and maintained by pulsed power from a welding power supply.

41. The method of claim 26, comprising logging the position and/or orientation of the stud welding gun and/or the stud during welding of the stud to the workpiece.

42. The method of claim 26, comprising logging at least one welding parameter during welding of the stud to the workpiece.

43. A stud welding system, comprising:

a power supply configured to perform a stud welding process and at least one other welding process, the power supply comprising control circuitry for executing the stud welding process and the at least one other welding process, and power conversion circuitry configured to output power suitable for a selected one of the welding processes; and

a stud welding gun configured to receive the output power from the power supply and to perform a stud welding process of studs to a workpiece

an automation system for positioning the stud welding gun at a desired location and orientation for welding of studs to the workpiece.

CLAIMS:

1. A stud welding system, comprising:

a power supply configured to perform a stud welding process and at least one other welding process, the power supply comprising control circuitry for executing the stud welding process and the at least one other welding process, and power conversion circuitry configured to output power suitable for a selected one of the welding processes;

a stud welding gun configured to receive the output power from the power supply and to perform a stud welding process of studs to a workpiece, wherein the stud welding gun comprises control circuitry for controlling movement of studs to the workpiece in a single direction without retraction of the studs during the stud welding process.

2. The system of claim 1, wherein the stud welding gun comprises an orientation sensor for detecting an angular orientation of the welding gun and/or a stud loaded in the welding gun for welding to the workpiece.

3. The system of claim 2, wherein the stud welding gun comprises a readout configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

4. The system of claim 2, wherein the stud welding gun comprises a light display configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

5. The system of claim 1, wherein the stud welding gun comprises a nozzle or standoff configured to space a stud to be welded at a desired location with respect to the workpiece and to automatically sense and/or control the spacing.

6. The system of claim 1, wherein the power supply is configured to perform stud welding based upon a pulsed welding regime.

7. The system of claim 1, wherein the stud welding gun is coupled to an automation system for positioning the stud welding gun at a desired location and orientation for welding of studs to the workpiece.

8. A stud welding gun, comprising:

control circuitry configured to control a stud welding process;

an orientation sensor for detecting a position and/or orientation of the welding gun and/or a stud charged in the welding gun for welding to a workpiece; and

a nozzle or standoff configured to at least partially surround the stud and to space the stud at a desired location with respect to the workpiece.

9. The stud welding gun of claim 8, comprising a readout configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

10. The stud welding gun of claim 8, comprising a light display configured to provide an operator perceptible indication of orientation of the welding gun and/or the stud.

11. The stud welding gun of claim 8, wherein the control circuitry is configured to automatically initiate an arc for welding of the stud upon detection of a desired position and/or orientation of the welding gun and/or stud.

12. A stud for use in stud welding, comprising:

a body; and

an arc-initiating extension from a lower surface of the body, the extension being configured to contact or come into close proximity with a workpiece for initiation of a welding arc in a process of welding the stud to the workpiece;

wherein the stud does not comprise a ferrule.

13. The stud of claim 12, wherein the arc-initiating extension comprises a bridge wire.

14. The stud of claim 13, wherein the bridge wire has a size substantially smaller in cross sectional area than the body of the stud.

15. The stud of claim 13, wherein the bridge wire has a sharpened lower extremity.

16. The stud of claim 12, wherein the arc-initiating extension is centered with respect to the lower surface of the body.

17. The stud of claim 12, wherein the arc-initiating extension is fitted into a recess formed in the body.

18. The stud of claim 12, wherein the arc-initiating extension is made of a material different from the body.

19. The stud of claim 12, wherein the arc-initiating extension is disposed at a periphery of the lower surface of the body.

20. A stud delivery device, comprising:

a support; and

a plurality of studs secured to the support in generally parallel or in-line fashion, the studs and support being configured for delivery in serial fashion to a stud welding gun.

21. The stud delivery device of claim 20, wherein the support comprises a tape.

22. The stud delivery device of claim 20, wherein the support comprises a magazine.

23. A method for stud welding, comprising:

loading a stud in a stud welding gun via an automated stud delivery system configured to deliver studs to the stud welding gun in a serial fashion, the stud having a body and an arc-initiating extension;

positioning the stud welding gun at a desired location with respect to a workpiece with the arc-initiating extension contacting or closely proximate the workpiece;

initiating a welding arc between the arc-initiating extension and the workpiece;

holding the stud away from the workpiece for a desired time while maintaining the arc between the stud and the workpiece; and

advancing the stud to the workpiece to join the stud to the workpiece.

24. The method of claim 23, comprising detecting a position and/or orientation of the stud welding gun and/or the stud.

25. The method of claim 24, comprising displaying a user viewable indication of the position and/or orientation of the stud welding gun and/or the stud.

26. The method of claim 24, comprising automatically initiating the welding arc when the position and/or orientation of the stud welding gun and/or the stud reach a desired position and/or orientation.

27. The method of claim 23, wherein the stud welding gun is positioned at the desired location by an automated system.

28. The method of claim 23, comprising applying a first current to the stud to initiate the arc, then applying a second, lower current to the stud following initiation of the arc.

29. The method of claim 28, wherein the first current is higher than about 400 A.

30. The method of claim 29, wherein the first current is applied at a high frequency to initiate the arc.

31. The method of claim 28, wherein the second current is lower than about 400 A.

32. The method of claim 31, comprising applying a current to the arc at less than about 100 A.

33. The method of claim 23, comprising advancing the stud to a desired proximity to the workpiece following initiation of the arc and before or during the step of holding the stud away from the workpiece.

34. The method of claim 23, wherein the stud is advanced at a slow rate following initiation of the arc.

35. The method of claim 23, comprising applying a shielding gas around the stud.

36. The method of claim 35, comprising confining the shielding gas via a nozzle or standoff of the stud welding gun.

37. The method of claim 23, wherein the arc is initiated and maintained by pulsed power from a welding power supply.

38. The method of claim 23, comprising logging the position and/or orientation of the stud welding gun and/or the stud during welding of the stud to the workpiece.

39. The method of claim 23, comprising logging at least one welding parameter during welding of the stud to the workpiece.

40. A stud welding system, comprising:

a power supply configured to perform a stud welding process and at least one other welding process, the power supply comprising control circuitry for executing the stud welding process and the at least one other welding process, and power conversion circuitry configured to output power suitable for a selected one of the welding processes;

an automated stud delivery system configured to deliver studs to the stud welding gun in a serial fashion;

a stud welding gun configured to receive the output power from the power supply and to perform a stud welding process of studs to a workpiece; and

an automation system for positioning the stud welding gun at a desired location and orientation for welding of studs to the workpiece.