CLAIMS:

1. A constant voltage (CV) welding process power supply comprising a controller configured to:

detect a short circuit event in a CV welding process;

increase a welding current based upon a periodically computed voltage error and a first gain;

detect whether the short circuit event has cleared; and

if the short circuit event has not cleared, increase the welding current based upon the periodically computed voltage error and a second gain higher than the first gain.

2. The CV welding process power supply of claim 1, wherein the short circuit event is detected based upon a voltage feedback dropping below a preset voltage level.

3. The CV welding process power supply of claim 1, further configured to operate without regard to voltage feedback for a predetermined period of time after initiating the increase of the welding current based upon the first gain, the second gain, and/or subsequent gains.

4. The CV welding process power supply of claim 1, further configured to monitor the short circuit event for a predetermined period of time prior to increasing the welding current at the first rate, and if the short circuit event clears during the predetermined period of time, to prevent the increase in the welding current.

5. The CV welding process power supply of claim 1, further configured to increase the welding current to a maximum welding current if the short circuit event does not clear after the welding current is increased based on the second gain.

6. The CV welding process power supply of claim 1, further configured to decrease the welding current to a desired welding current level after the short circuit event has cleared.

7. The CV welding process power supply of claim 1, further configured to decrease a welding voltage to a desired weld voltage level after the short circuit event has cleared.

8. The CV welding process power supply of claim 1, wherein the voltage error is based upon a difference between a desired welding voltage and a periodically sensed voltage.

9. The CV welding process power supply of claim 1, wherein the controller is further configured to continue to detect whether the short circuit event has cleared, and if the short circuit event has not cleared in a predetermined time, continue to increase the welding current based upon the periodically computed voltage error and a gain higher than the previous gain.

10. A CV welding process power supply comprising:

a current sensor configured to sense current of welding power supplied by the power supply to a welding application;

a voltage sensor configured to sense voltage of the welding power;

a short circuit detection circuit coupled at least to the voltage sensor and configured to detect a short circuit in the welding power; and

a control circuit configured to determine a voltage error and to increase the current of the welding power in two or more progressively aggressive short circuit clearing stages, wherein the current is increased based upon the voltage error and a progressively increasing gain in each of the short circuit clearing stages.

11. The CV welding process power supply of claim 10, wherein the control circuit is configured to implement a delay stage before and/or after the two or more progressively aggressive short circuit clearing stages, wherein the welding power is supplied without regard to sensed voltage during the delay stage.

12. The CV welding process power supply of claim 10, wherein the control circuit is configured to implement a maximum current stage wherein the welding current is increased to a maximum welding current if the short circuit event does not clear after the two or more progressively aggressive short circuit clearing stages.

13. The CV welding process power supply of claim 10, wherein the welding current is decreased to a desired welding current level after a short circuit event has cleared.

14. The CV welding process power supply of claim 10, wherein a welding voltage is decreased to a desired welding voltage level after a short circuit event has cleared.

15. A CV welding process power supply, comprising:

a current sensor configured to sense current of welding power supplied by the power supply to a welding application;

a voltage sensor configured to sense voltage of the welding power;

a short circuit detection circuit coupled at least to the voltage sensor and configured to detect a short circuit in the welding power; and

a control circuit configured to increase a welding current based upon a difference between the sensed voltage and a desired voltage, and a first gain, to operate without regard to voltage feedback for a first predetermined period of time after initiating increase of the welding current based on the first gain, to increase the welding current based upon the difference between the sensed voltage and the desired voltage, and a second gain higher than the first gain if the short circuit event has not cleared, and to operate without regard to voltage feedback for a second predetermined period of time after increasing the welding current based on the second gain.

16. The CV welding process power supply of claim 15, wherein the control circuit is configured to decrease the welding current to a desired welding current level after the short circuit event has cleared.

17. The CV welding process power supply of claim 15, wherein the control circuit is configured to decrease a welding voltage to a desired welding voltage level after the short circuit event has cleared.

18. The CV welding process power supply of claim 15, wherein the control circuit is configured to increase the welding current to a maximum welding current if the short circuit event does not clear after the welding current is increased based upon the second gain.

19. The CV welding process power supply of claim 18, wherein the control circuit is configured to operate without regard to voltage feedback for a third predetermined period of time after increasing the welding current to the maximum welding current.

20. The CV welding process power supply of claim 15, wherein the short circuit event comprises voltage feedback dropping below a preset voltage level.

21. A constant voltage (CV) welding process power supply comprising a controller configured to:

compute a varying minimum current level during a welding process;

compute a voltage error during a welding process;

generate a current command signal to minimize the computed voltage error;

compare the current command signal to the computed varying minimum current level; and

apply either the current command signal or the computed varying minimum current level for control of welding output based upon the comparison.

22. The CV welding process power supply of claim 21, wherein the computed voltage error is based upon a difference between a desired welding voltage and a sensed voltage.

23. The CV welding process power supply of claim 21, wherein the computed varying minimum current level is approximately equal to a computed running current value minus an offset value.

24. The CV welding process power supply of claim 23, wherein the computed running current value is approximately equal to an instantaneous current value averaged with one or more previous current values.

25. The CV welding process power supply of claim 23, wherein the offset value remains constant throughout a welding process.

26. The CV welding process power supply of claim 25, wherein the offset value is equal to approximately 70 Amps.

27. The CV welding process power supply of claim 21, wherein the controller is further configured to sample an instantaneous current one or more times and reset the computed minimum current level based on the sampled current.

28. A CV welding process power supply comprising:

a current sensor configured to sense current of welding power supplied by the power supply to a welding process;

a voltage sensor configured to sense voltage of the welding power; and

a control circuit that received signals indicative of the sensed current and voltage, and is configured to periodically compute a voltage error and a current command signal based on the voltage error, and if the current command signal is not less than a periodically computed minimum current level, then apply a current level indicated by the current command signal for control of welding output, and if the current command signal is less than the periodically computed minimum current level, then apply the periodically computed minimum current level for control of welding output.

29. The CV welding process power supply of claim 28, wherein the periodically computed voltage error is based upon a difference between a desired welding voltage and a voltage sensed by the voltage sensor.

30. The CV welding process power supply of claim 28, wherein the periodically computed minimum current level is approximately equal to a periodically computed running current value minus an offset value.

31. The CV welding process power supply of claim 30, wherein the periodically computed running current value is approximately equal to an instantaneous current value averaged with one or more previous current values.

32. The CV welding process power supply of claim 30, wherein the offset value remains constant throughout a welding process.

33. The CV welding process power supply of claim 28, wherein the control circuit is further configured to sample an instantaneous current one or more times with the current sensor and reset the periodically computed minimum current level based on the sampled current.

34. The CV welding process power supply of claim 33, wherein the instantaneous current is sampled approximately every 100 μs.

35. A constant voltage (CV) welding process power supply comprising a controller configured to:

periodically compute a running current value during a welding process; and

periodically compute a minimum current value based on the running current value and an offset value.

36. The CV welding process power supply controller of claim 35, further configured to generate a current command signal to minimize a periodically computed voltage error.

37. The CV welding process power supply controller of claim 36, wherein if the current command signal is not less than the periodically computed minimum current value, then the power supply applies a current level indicated by the current command signal for control of welding output, and if the current command signal is less than the periodically computed minimum current value, then apply the periodically computed minimum current level for control of welding output.

38. The CV welding process power supply controller of claim 36, wherein the periodically computed voltage error is based upon a difference between a desired welding voltage and a sensed voltage.

39. The CV welding process power supply controller of claim 35, wherein the running current value is a running average of welding output current.

40. The CV welding process power supply controller of claim 39, wherein the offset value is a fixed value.

CLAIMS:

1. A constant voltage (CV) welding process power supply comprising a controller having:

a short circuit detection circuit configured to detect a short circuit event in a CV welding process;

a control circuit configured to increase a welding current at a first rate based upon a periodically computed voltage error and a first gain; and

a short circuit clearance detection circuit configured to detect whether the short circuit event has cleared;

wherein the control circuit is configured to increase the welding current based upon the periodically computed voltage error and a second gain higher than the first gain if the short circuit event has not cleared, and wherein the control circuit is configured to continue to detect whether the short circuit event has cleared, and if the short circuit event has not cleared in a predetermined time, to continue to increase the welding current based upon the periodically computed voltage error and a gain higher than the previous gain.

2. The CV welding process power supply of claim 1, wherein the short circuit event is detected based upon a voltage feedback dropping below a preset voltage level.

3. The CV welding process power supply of claim 1, wherein the control circuit is configured to operate without regard to voltage feedback for a predetermined period of time after a time at which the welding current is increased based upon the first gain, the second gain, and/or subsequent gains.

4. The CV welding process power supply of claim 1, wherein the control circuit is configured to monitor the short circuit event for a predetermined period of time prior to increasing the welding current at the first rate, and if the short circuit event clears during the predetermined period of time, to prevent the increase in the welding current.

5. The CV welding process power supply of claim 1, wherein the control circuit is configured to increase the welding current to a maximum welding current if the short circuit event does not clear after the welding current is increased based on the second gain.

6. The CV welding process power supply of claim 1, wherein the control circuit is configured to decrease the welding current to a desired welding current level after the short circuit event has cleared.

7. The CV welding process power supply of claim 1, wherein the control circuit is configured to decrease a welding voltage to a desired weld voltage level after the short circuit event has cleared.

8. The CV welding process power supply of claim 1, wherein the voltage error is based upon a difference between a desired welding voltage and a periodically sensed voltage.

9. A CV welding process power supply comprising:

a current sensor configured to sense current of welding power supplied by the power supply to a welding application;

a voltage sensor configured to sense voltage of the welding power;

a short circuit detection circuit coupled at least to the voltage sensor and configured to detect a short circuit in the welding power; and

a control circuit configured to determine a voltage error and to increase the current of the welding power in two or more progressively aggressive short circuit clearing stages, wherein the current is increased based upon the voltage error and a progressively increasing gain in each of the short circuit clearing stages.

10. The CV welding process power supply of claim 9, wherein the control circuit is configured to implement a delay stage before and/or after the two or more progressively aggressive short circuit clearing stages.

11. The CV welding process power supply of claim 9, wherein the control circuit is configured to implement a maximum current stage wherein the welding current is increased to a maximum welding current if the short circuit event does not clear after the two or more progressively aggressive short circuit clearing stages.

12. The CV welding process power supply of claim 9, wherein the welding current is decreased to a desired welding current level after a short circuit event has cleared.

13. The CV welding process power supply of claim 9, wherein a welding voltage is decreased to a desired welding voltage level after a short circuit event has cleared.

14. A CV welding process power supply, comprising:

a current sensor configured to sense current of welding power supplied by the power supply to a welding application;

a voltage sensor configured to sense voltage of the welding power;

a short circuit detection circuit coupled at least to the voltage sensor and configured to detect a short circuit event in the welding power;

a short circuit clearance detection circuit configured to detect whether the short circuit event has cleared; and

a control circuit configured to increase, at a first time, a welding current based upon a difference between the sensed voltage and a desired voltage, and a first gain, to operate without regard to voltage feedback for a first predetermined period of time after the first time, to increase, at a second time following the first predetermined period of time, the welding current based upon the difference between the sensed voltage and the desired voltage, and a second gain higher than the first gain if the short circuit event has not cleared, and to operate without regard to voltage feedback for a second predetermined period of time after the second time.

15. The CV welding process power supply of claim 14, wherein the control circuit is configured to decrease the welding current to a desired welding current level after the short circuit event has cleared.

16. The CV welding process power supply of claim 14, wherein the control circuit is configured to decrease a welding voltage to a desired welding voltage level after the short circuit event has cleared.

17. The CV welding process power supply of claim 14, wherein the control circuit is configured to increase, at a third time following the second predetermined period of time, the welding current to a maximum welding current if the short circuit event does not clear after the welding current is increased based upon the second gain.

18. The CV welding process power supply of claim 17, wherein the control circuit is configured to operate without regard to voltage feedback for a third predetermined period of time after the third time.

19. The CV welding process power supply of claim 14, wherein the short circuit event comprises voltage feedback dropping below a preset voltage level.