



(51) International Patent Classification:

B23K 9/095 (2006.01) **B23K 9/32** (2006.01)
B23K 9/173 (2006.01) **B23K 9/10** (2006.01)

(21) International Application Number:

PCT/US2012/030108

(22) International Filing Date:

22 March 2012 (22.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/467,456 25 March 2011 (25.03.2011) US
13/426,238 21 March 2012 (21.03.2012) US

(71) Applicant (for all designated States except US):

ILLINOIS TOOL WORKS INC. [US/US]; 3600 West
Lake Avenue, Glenview, Illinois 60026-1215 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **MEHN, Peter D.**

[US/US]; c/o Illinois Tool Works Inc., 3600 West Lake
Avenue, Glenview, Illinois 60026 (US). **VOGEL, Bern-
ard J.** [US/US]; c/o Illinois Tool Works Inc., 3600 West
Lake Avenue, Glenview, Illinois 60026 (US).

(74) Agents: **YODER, Patrick S.** et al.; P.O. Box 692289,
Houston, Texas 77269-2289 (US).(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every

kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU,
TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,
DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))

(54) Title: A SYSTEM WITH WELDING POWER SUPPLY AND CONTROLLED AUXILIARY POWER; CORRESPONDING METHOD

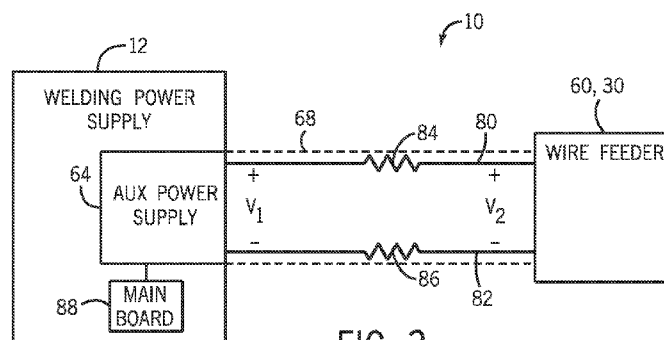


FIG. 3

(57) Abstract: A system (10) includes a welding power supply unit (12) and control circuitry (66). The welding power supply unit (12) includes an auxiliary power supply (64) configured to supply power to an auxiliary power load (60, 62) connected to the auxiliary power supply (64). The control circuitry (66) is configured to detect a voltage received by the auxiliary power load (60, 62) from the auxiliary power supply (64), compare an output voltage generated by the auxiliary power supply (64) with the voltage received by the auxiliary power load (60, 62), and apply a correction factor to the output voltage from the auxiliary power supply (64) based at least in part on the comparison of the output voltage generated by the auxiliary power supply (64) and the voltage received by the auxiliary power load (60, 62).

A SYSTEM WITH WELDING POWER SUPPLY AND CONTROLLED AUXILIARY POWER; CORRESPONDING METHOD

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application No. 13/426,238 entitled “Welding Power Supply with Controlled Auxiliary Power” filed March 21, 2012 and U.S. Provisional Patent Application No. 61/467,456, entitled “Welding Power Supply with Controlled Auxiliary Power” and filed March 25, 2011, which are herein incorporated by reference in its entirety.

BACKGROUND

[0002] The invention relates generally to welding systems and, more particularly, to a welding system configured to support auxiliary devices.

[0003] Welding systems often include various welding accessories or other equipment, such as wire feeders, shielding gas sources, and so forth. As such, the welding systems may include a power supply configured to provide power to these accessories, referred to as auxiliary power. Auxiliary power is typically unregulated, and may be delivered at various constant power levels, for example 115 VAC rated at 20 amps or 42 VDC rated at 10 amps. However, the load demand of the accessories may vary depending on the particular arrangement of accessories or the welding operation, and the auxiliary power may not respond to these variations. Thus, the operation of the welding accessory may be inefficient and may result in inrush current, overload current, or other undesirable conditions.

BRIEF DESCRIPTION

[0004] In a first embodiment, a system includes a welding power supply unit and control circuitry. The welding power supply has an auxiliary power supply configured to supply power to an auxiliary power load. The control circuitry is configured to determine parameters relating to an interconnection cable connecting the auxiliary power supply and the auxiliary power load.

[0005] In a second embodiment, a method includes: generating output power having an output parameter from an auxiliary power supply of a welding unit; detecting a received parameter relating to received power by an auxiliary power load connected to the auxiliary power supply; comparing the output parameter generated by the auxiliary power supply and the received parameter received by the auxiliary power load; and applying a correction factor to the output parameter of the auxiliary power supply based at least in part on the comparison of the output parameter and the received parameter.

[0006] In a third embodiment, a system includes a welding power supply unit and control circuitry. The welding power supply unit includes an auxiliary power supply configured to supply power to an auxiliary power load connected to the auxiliary power supply. The control circuitry is configured to detect a voltage received by the auxiliary power load from the auxiliary power supply, compare an output voltage generated by the auxiliary power supply with the voltage received by the auxiliary power load, and apply a correction factor to the output voltage from the auxiliary power supply based at least in part on the comparison of the output voltage generated by the auxiliary power supply and the voltage received by the auxiliary power load.

DRAWINGS

[0007] These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

[0008] FIG. 1 is a perspective view of an embodiment of a welding system that includes a welding power supply with controlled auxiliary power;

[0009] FIG. 2 is a schematic diagram of an embodiment of a portion of a welding system that includes a welding power supply with elements to control auxiliary power;

[0010] FIG. 3 is a schematic diagram of an embodiment of a welding system illustrating an interconnection between an auxiliary power supply and an auxiliary power load;

[0011] FIG. 4 is a schematic diagram of an embodiment of a control system including elements to control auxiliary power; and

[0012] FIG. 5 is a flow chart of an embodiment of a method to control auxiliary power in accordance with aspects of the present techniques.

DETAILED DESCRIPTION

[0013] Turning now to the figures, FIG. 1 illustrates an embodiment of a welding system 10 which powers, controls, and provides supplies to a welding operation. The welding system 10 includes a welding power supply 12 having an input device (e.g., a control panel 14) through which a welding operator may control the supply of welding materials, such as gas flow, wire feed, and so forth, to a welding gun 16. To that end, the control panel 14 includes input or interface devices, such as knobs 18 that the operator may use to adjust welding parameters (e.g., voltage, current, etc.). The welding power supply 12 may also include a tray 20 mounted on a back of the welding power supply 12 and configured to support a gas cylinder 22 held in place with a chain 24. The gas cylinder 22 is the source of the gas that supplies the welding gun 16. Furthermore, the welding power supply 12 may be portable via a set of smaller front wheels 26 and a set of larger back wheels 28, which enable the operator to move the welding power supply 12 to the location of the weld.

[0014] In certain embodiments, the welding system 10 may include auxiliary power loads such as wire feeders, pendants, water coolers, automatic controls (e.g., remote controls), and/or robot interfaces. As such, the welding power supply 12 may be configured to provide power (e.g., auxiliary power) to these auxiliary power loads. In addition, other equipment may be powered from an auxiliary power output on the welding power supply 12, such as grinders, lights, or other devices that may be used in a welding operation but are not included within the welding system 10. Further,

the welding power supply 12 may include circuitry and other elements to control the auxiliary power and display status information about the auxiliary power.

[0015] As illustrated, the welding system 10 includes an auxiliary power load (e.g., a wire feeder 30). The wire feeder 30 provides welding wire to the welding gun 16 for use in the welding operation. The wire feeder 30 may include a control panel 32 that allows the user to set one or more wire feed parameters, such as wire feed speed. Additionally, the wire feeder 30 may house a variety of internal components, such as a wire spool, a wire feed drive system, a motor, and so forth. Additionally, the wire feeder 30 may be used with any wire feeding process, such as gas operations (gas metal arc welding (GMAW)) or gasless operations (flux cored arc welding (FCAW)). For example, the wire feeder 30 may be used in metal inert gas (MIG) welding.

[0016] A variety of cables couples the components of the welding system 10 together and facilitates the supply of welding materials to the welding gun 16. A first cable 34 (e.g., interconnection cable) couples the welding gun 16 to the wire feeder 30. A second cable 36 couples the welding power supply 12 to a work clamp 38 that connects to a workpiece 40 to complete the circuit between the welding power supply 12 and the welding gun 16 during a welding operation. A bundle 42 of cables (e.g., interconnection cables) couples the welding power supply 12 to the wire feeder 30 and provides weld materials for use in the welding operation. It should be noted that the bundle 42 of cables may not be bundled together in some embodiments. The bundle 42 includes a welding power lead 44, a gas hose 46, and a control cable 48.

[0017] As discussed previously, the bundle 42 may also provide auxiliary power to various auxiliary power loads of the welding system 10. A portion of the auxiliary power may be dissipated as it travels through the bundle 42 due to an internal resistance of the bundle 42. For example, the welding power supply 12 may provide a power output of approximately 42 V, but the power input received by the wire feeder 30 may be 30-35 V (i.e., the voltage dissipated by the bundle 42 may be approximately 7-12 V). Thus, the auxiliary power supplied by the welding power supply 12 may be less than the power output received by an auxiliary power load. Certain embodiments of the welding power supply 12 may include control and

feedback circuitry to increase and/or stabilize the power input received by auxiliary loads, as further described in FIG. 2.

[0018] FIG. 2 is a schematic diagram of an embodiment of a portion of the welding system 10. The welding power supply 12 is configured to control auxiliary power and adjust the power received by auxiliary loads 60, 62. As illustrated, the welding power supply 12 includes an auxiliary power supply 64 and control circuitry 66. In certain embodiments, the control circuitry 66 may be at least partially external to the welding power supply 12 (e.g., at least partially contained within the auxiliary loads 60, 62, or some other components of the welding system 10). Additionally, the welding power supply 12 may include one or more auxiliary power supplies 64 with varying voltage and/or current ratings to feed one or more auxiliary loads 60, 62. During the welding operation, the load drawn by the auxiliary loads may vary, and it may be beneficial to adjust an output power generated by the auxiliary power supply 64. As shown, control circuitry 66 adjusts the power received by the auxiliary loads 60, 62 to improve the efficiency of the welding operation. In other embodiments, the welding system 10 may include 1, 2, 3, 4, 5, or more auxiliary loads, and the control circuitry 66 may adjust the power input to each of those loads. Further, each auxiliary load 60, 62 may have independent control circuitry 66 to adjust the power received by each auxiliary load 60, 62. As illustrated, the single auxiliary power supply 64 supplies power to both of the auxiliary loads 60, 62.

[0019] The auxiliary power supply 64 generates an output power that may be controlled or regulated. In certain embodiments, the auxiliary power supply 64 may include various circuits, such as buck, boost, full bridge, half bridge, forward, flyback, controlled rectifier, linear regulator, or a combination thereof, to regulate or condition the output power. Thus, the power supply 64 may use any circuit topology that is suitable to provide a controlled or regulated output power. Further, the auxiliary power supply 64 may provide multiple auxiliary power outputs (e.g., 24 VDC and 115 VAC). As illustrated, the auxiliary power supply 64 is connected to the auxiliary loads 60, 62 via interconnection cables 68, 70. Specifically, the interconnection cable 68 connects the auxiliary power supply 64 to the auxiliary load 60, and the interconnection cable 70 connects the auxiliary power supply 64 to the auxiliary load

62. In other embodiments, the auxiliary loads 60, 62 may be connected to the auxiliary power supply 64 with a single interconnection cable.

[0020] The interconnection cables 68, 70 generally transfer power from the auxiliary power supply 64 to the auxiliary loads 60, 62. In certain embodiments, the lengths of the interconnection cables 68, 70 may vary depending on the configuration of the welding system 10. For example, the interconnection cable 68 may be approximately 300 ft long, and the interconnection cable 70 may be approximately 3 feet long. As discussed previously, a portion of the auxiliary power may be dissipated as it travels through the interconnection cables 68, 70 due to internal resistances, especially for longer interconnection cables 68, 70. Thus, the power received by the auxiliary loads 60, 62 may be less than the output power generated by the auxiliary power supply 64. Accordingly, the welding system 10 may include control circuitry 66, sensors 72, 74, and communication lines 76 to adjust and/or stabilize the auxiliary power to offset the dissipated power and to improve efficiency of the welding operation.

[0021] The sensors 72, 74 are communicatively coupled to control circuitry 66 via feedback lines 78, 80. In certain embodiments, the sensors 72, 74 may be coupled to, or included in, the communication lines 76. The sensors 72, 74 are configured to detect and/or measure a parameter (e.g., voltage) of the auxiliary power received by the auxiliary loads 60, 62, respectively. Additionally, the sensors 72, 74 may also be configured to detect and/or measure a parameter (e.g., voltage) of the output power generated by the auxiliary power supply 64. The sensors 72, 74 may measure one or more parameters simultaneously, such as voltage, current, power, temperature, resistance, or a combination thereof. Further, the sensors 72, 74 may detect and/or measure the one or more parameters continuously or discretely. For example, the sensors 72, 74 may measure the voltage and the current received by the auxiliary loads 60, 62 with a frequency of approximately 0.1, 10, 60, or 120 Hz, or another suitable rate set by an operator or software instructions. Further, the sensors 72, 74 may detect and/or measure the one or more parameters at predetermined time intervals (e.g., once every five minutes, once every minute, once every fifteen seconds, once every five seconds, once every second, once every millisecond, and so

forth). Furthermore, in certain embodiments, the sensors 72, 74 may be configured to operate upon startup of the welding power supply 12, upon connection of the interconnection cables 68, 70 to the auxiliary power supply 64, upon activation of an input device (e.g., button, switch, slider, touch screen, and so forth) on the control panel 14, or at another suitable time determined by an operator or by software instructions.

[0022] The communication lines 76 are communicatively coupled to the control circuitry 66 and may communicate a variety of feedback information to the control circuitry 66. For example, the communication lines 76 may provide status information of the auxiliary loads 60, 62, resistance information of the interconnection cables 68, 70, or other feedback information that may be used to modify the operation of the auxiliary power supply 64 to improve efficiency of the welding operation. In certain embodiments, the source of the feedback information may be the auxiliary loads 60, 62 or another device external to the loads 60, 62 (e.g., a sensor or controller). For example, the communication lines 76 may include thermal sensors to provide thermal protection and fan control, sequencing signals to coordinate the power up sequencing of the auxiliary power supply 64 as a part of the welding power supply 12, and/or alarm setpoints to communicate undesirable conditions to the control panel 14. In addition, the communication lines 76 may include one or more analog or digital communication lines. In certain embodiments, the communication lines 76 may include power line communications, wireless communications, analog signal pairs, digital communications, and/or the like.

[0023] In some embodiments, the communication lines 76 may include the sensors 72, 74 and the feedback lines 78, 80 to communicate parameter information to the control circuitry 66. Further, in certain embodiments, the interconnection cables 68, 70 may include the communication lines 76. Additionally, the communication lines 76 may provide bi-direction communication between the auxiliary loads 60, 62 and the auxiliary power supply 64. For example, the auxiliary loads 60, 62 may communicate a maximum load to the power supply 64, or the auxiliary power supply 64 may communicate an auxiliary power status to the auxiliary loads 60, 62. The welding power supply 12 or other components within the welding system 10 may

receive and utilize this information (e.g., auxiliary power status) for various functions, such as detecting an overload or fault condition. In general, the communication lines 76 may improve the coordination between the auxiliary power supply 64 and the auxiliary loads 60, 62.

[0024] The control circuitry 66 is configured to receive information from the sensors 72, 74 and the communication lines 76 to adjust and/or stabilize the auxiliary power to improve efficiency of the welding operation. For example, the control circuitry 66 may adjust the output power of the auxiliary power supply 64 in response to the voltage information from the sensors 72, 74. As discussed previously, the power received by the auxiliary loads 60, 62 may be less than the output power generated by the auxiliary power supply 64. Additionally, the load drawn by the auxiliary loads 60, 62 may vary over the course of the welding operation. Thus, the control circuitry 66 may apply a correction factor to the output power to adjust and/or stabilize the power received by the auxiliary loads 60, 62. For example, the welding power supply 12 may provide a power output of approximately 42 V, but the power input received by the auxiliary devices 60, 62 may be 30-35 V (i.e., the voltage dissipated by the interconnection cables 60, 62 may be approximately 7-12 V). In such a scenario, the control circuitry 66 may apply a correction factor to increase the power output of the welding power supply 12 to approximately 50 V, so that the power input received by the auxiliary devices 60, 62 is approximately 42 V. The adjusted and stabilized power input received by the auxiliary devices 60, 62 may improve efficiency of the welding operation.

[0025] The control circuitry 66 may also limit a parameter of the power received by the auxiliary loads 60, 62 or the output power generated by the auxiliary power supply 64. Thus, the output power may be bounded such that the output parameters (e.g., voltage or current) are limited to a predetermined maximum value. The communication lines 76 may report a fault or overload condition to the welding power supply 12 or control panel 14 when the voltage received by the auxiliary loads 60, 62 is greater than the maximum voltage. Additionally or alternatively, the control circuit 66 may disable the auxiliary power supply 64 when the power demand by the auxiliary loads 60, 62 exceeds a predetermined level. As may be appreciated, the

instrumentation and shutdown logic may vary among different embodiments of the welding system 10.

[0026] As discussed previously, the welding system 10 may include elements to adjust and/or stabilize power input received by the auxiliary devices 60, 62 and improve efficiency of the welding operation. To this end, the auxiliary power supply 64 may include circuitry to detect and/or measure an output voltage V1 generated by the auxiliary power supply 64. The auxiliary power supply 64 may communicate the output voltage V1 to the control circuitry 66 via a bi-directional communication line 82. Additionally, the sensors 72, 74 may measure a voltage V2 and/or current I1 received by the auxiliary loads 60, 62. The sensors 72, 74 may communicate this parameter information to the control circuitry 66 via the feedback lines 78, 80 or the communication lines 76. With this information, the control circuitry 66 may calculate a correction factor that may be used to adjust the voltage V2 in a manner proportional to the current I1. For example, the control circuitry 66 may calculate a resistance R1 of the interconnection cables 68, 70 based at least partially on the voltages V1, V2 and the current I1. The output voltage V1 may be adjusted by some factor of the resistance R1 of the interconnection cables 68, 70. In other embodiments, the resistance R1 may be estimated using various parameters that may be input by an operator at the input device (e.g., control panel 14). These parameters may include the lengths of the interconnection cables 68, 70, the types of the interconnection cables 68, 70 (e.g., identified by part number, etc.), a type of welding process (e.g., MIG or TIG) performed by the welding system 10, or a combination thereof.

[0027] Further, the resistance R1 may be used by the control circuitry 66 to adjust the output voltage V1 using an analog or digital adjustment. For example, the adjustment may be performed by a feedback control loop including the communications lines 76 using software instructions; however, in other embodiments, the output voltage V1 may be controlled using a feedback control loop that consists entirely of hardware (e.g., that operates without input from software). Further, the resistance R1 and/or adjustment of the output voltage V1 may occur at predetermined time intervals before, during, or after the welding operation. For example, the control circuitry 66 may be configured to operate upon startup of the welding power supply

12, upon connection of the interconnection cables 68, 70 to the auxiliary power supply 64, upon activation of an input device (e.g., button, switch, slider, touch screen, and so forth) on the control panel 14, or at another suitable time determined by an operator or by software instructions. Thus, the control circuitry 66 may reduce the likelihood or magnitude of inrush current overload current, or other undesirable conditions. Accordingly, the control circuitry 66 may determine parameters (e.g., a resistance or voltage drop) related to the interconnection cables 68, 70 and adjust an output parameter (e.g., output voltage V_1) of the output power generated by the auxiliary power supply 64 to improve the efficiency of the welding operation, as is further illustrated in FIG. 3.

[0028] FIG. 3 is a schematic diagram of an embodiment of the welding system 10 illustrating the interconnection cable 68 between the auxiliary power supply 64 and the auxiliary power load 60 (e.g., the wire feeder 30). The interconnection cable 68 connects the auxiliary power supply 64 of the welding power supply 12 to the auxiliary power load 60. Additionally, the interconnection cable 68 includes an auxiliary power line 80 and an auxiliary power return line 82. The auxiliary power line 80 and the auxiliary return line 82 may form a complete circuit between the auxiliary power supply 64 and the auxiliary power load 60, enabling energy to flow between the two. The auxiliary power line 80 has an internal resistance 84, and the auxiliary return line 82 has an internal resistance 86. The combination of the internal resistances 84, 86 may approximately equal the resistance R_1 of the interconnection cable 68.

[0029] As illustrated, the auxiliary power supply 64 generates power at the output voltage V_1 , and the auxiliary power load 60 receives power at the received voltage V_2 . The received voltage V_2 may be less than the output voltage V_1 due to the resistance R_1 of the interconnection cable 68. Further, the received voltage V_2 may be less than a desired voltage of the auxiliary power load 60 due to a change in the parameters of the welding operation. In certain embodiments, the auxiliary power supply 64 may include the control circuitry 66 to adjust the output voltage V_1 to adjust the received voltage V_2 and improve the efficiency of the welding operation. To this end, as described below in FIG. 4, the welding power supply 12 may include a

main board 88 configured to communicate software instructions to the auxiliary power supply 64 and/or the control circuitry 66.

[0030] FIG. 4 illustrates the main board 88 configured to improve the efficiency of the welding operation by using software instructions communicated to the auxiliary power supply 64. The main board 88 includes a processor 90 and/or other data processing circuitry to execute the software instructions. These instructions may be encoded in programs that may be executed by the processor 90. Further, these instructions may be stored in any suitable article of manufacture that includes at least one tangible non-transitory, computer-readable medium that collectively stores these instructions or routines, such as storage 92 or memory 94. The storage 92 and the memory 94 may include, for example, random-access memory, read-only memory, rewritable memory, hard drive(s), and/or optical discs. In some embodiments, the main board 88 may include a display 96 for displaying, for example, a graphical user interface and/or data related to the welding system 10.

[0031] The display 96 may include a user interface for an operator to input information about the welding system 10. For example, an operator may input into the display 96 a length of the interconnection cable 68, 70, a type of the interconnection cable 68, 70 (e.g., identified by part number, etc.), a type of a welding process performed, or a combination thereof. The control circuitry 66 may use this information to adjust the output power generated by the auxiliary power supply 64 to improve efficiency of the welding operation. Further, in certain embodiments, the operator may input alarm setpoints that may be used by the control circuitry 66 to limit various parameters of the welding operation. For example, the operator may limit the output power generated by the auxiliary power supply 64 to a predetermined maximum or minimum value. The display 96 may communicate general status information and may report a fault or overload condition to an operator.

[0032] FIG. 5 illustrates a flow chart of an embodiment of a method 98 to control auxiliary power of the welding system 10. The auxiliary power supply 64 may generate (block 100) output power having an output parameter (e.g., voltage, current, power). The output power may travel along the interconnection cables 68, 70 to the

auxiliary loads 60, 62. The auxiliary loads 60, 62 may then detect (block 102) received power having a received parameter (e.g., voltage, current power). The detected (block 102) parameter may be communicated to the auxiliary power supply 64 and/or the control circuitry 66 via the communication lines 76 and/or the feedback lines 78, 80. As discussed previously, the detected (block 102) parameter may be inadequate for efficient operation of the auxiliary loads 60, 62. The auxiliary power supply 64 and/or the control circuitry 66 may compare (block 104) the output parameter and the received parameter. In certain embodiments, comparing (block 104) the parameters may include calculating or estimating the resistance R_1 of the interconnection cables 68, 70. The auxiliary power supply 64 and/or control circuitry may adjust (block 106) the output power to improve efficiency of the welding operation. In some embodiments, the output power may be adjusted (block 106) by some factor of the resistance R_1 . The welding system 10 may continue to detect (block 102) the received parameter to further improve the efficiency of the welding operation.

[0033] While only certain features of the invention have been illustrated and described herein, many modifications and changes will occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the invention.

CLAIMS:

1. A system, comprising:
a welding power supply unit having an auxiliary power supply configured to supply power to an auxiliary power load; and
control circuitry configured to determine parameters relating to an interconnection cable connecting the auxiliary power supply and the auxiliary power load.
2. The system of claim 1, wherein the control circuitry is configured to determine the parameters relating to the interconnection cable by comparing a voltage delivered from the auxiliary power supply to a voltage received by the auxiliary power load.
3. The system of claim 1, wherein the control circuitry is configured to apply a correction factor to an output voltage supplied from the auxiliary power supply to the auxiliary power load based at least in part on the determined parameters relating to the interconnection cable.
4. The system of claim 1, wherein the control circuitry is configured to operate in a mode wherein the control circuitry determines the parameters relating to the interconnection cable at predetermined time intervals.
5. The system of claim 1, wherein the control circuitry is configured to operate in a mode wherein the control circuitry determines the parameters relating to the interconnection cable upon startup of the welding power supply unit, upon connection of the interconnection cable to the auxiliary power supply, upon activation of an input device on an operator interface of the welding power supply unit, or a combination thereof.

6. The system of claim 1, wherein the control circuitry is configured to determine the parameters relating to the interconnection cable based at least in part on information input by an operator.

7. The system of claim 6, wherein the information comprises a length of the interconnection cable, a type of the interconnection cable, a type of a welding process, or a combination thereof, input by the operator.

8. The system of claim 1, wherein the control circuitry comprises software instructions for controlling an output voltage of the auxiliary power supply based on the determined parameters relating to the interconnection cable.

9. The system of claim 1, wherein the control circuitry comprises circuitry for performing analog or digital adjustment of an output voltage of the auxiliary power supply based on the determined parameters relating to the interconnection cable.

10. The system of claim 1, wherein the auxiliary power load comprises at least one of: a welding wire feeder, a welding remote control, or a user interface device.

11. A method, comprising:
generating output power having an output parameter from an auxiliary power supply of a welding power supply unit;
detecting a received parameter relating to received power received by an auxiliary power load connected to the auxiliary power supply;
comparing the output parameter generated by the auxiliary power supply and the received parameter received by the auxiliary power load; and
applying a correction factor to the output parameter of the auxiliary power supply based at least in part on the comparison of the output parameter and the received parameter.

12. The method of claim 11, wherein the output parameter comprises an output voltage, an output current, an output power level, or a combination thereof, and the received parameter comprises a received voltage, a received current, a received power level, or a combination thereof.

13. The method of claim 11, comprising comparing the output and received parameters and applying the correction factor at predetermined time intervals.

14. The method of claim 11, comprising applying the correction factor to the output parameter upon startup of the welding power supply unit, upon connection of an interconnection cable to the auxiliary power supply and the auxiliary power load, upon activation of an input device on an operator interface of the welding power supply unit, or a combination thereof.

15. The method of claim 11, comprising comparing the output and received parameters based at least in part on information input by an operator.

16. The method of claim 15, comprising applying the correction factor to the output parameter based at least in part on a length of an interconnection cable connecting the auxiliary power supply and the auxiliary power load, a type of the interconnection cable, a type of a welding process, or a combination thereof, input by the operator.

17. The method of claim 11, comprising applying the correction factor to the output parameter using software instructions.

18. The method of claim 11, comprising performing analog or digital adjustment of the output parameter of the auxiliary power supply.

19. The method of claim 11, wherein the auxiliary power load comprises at least one of: a welding wire feeder, a welding remote control, or a user interface device.

20. A system, comprising:

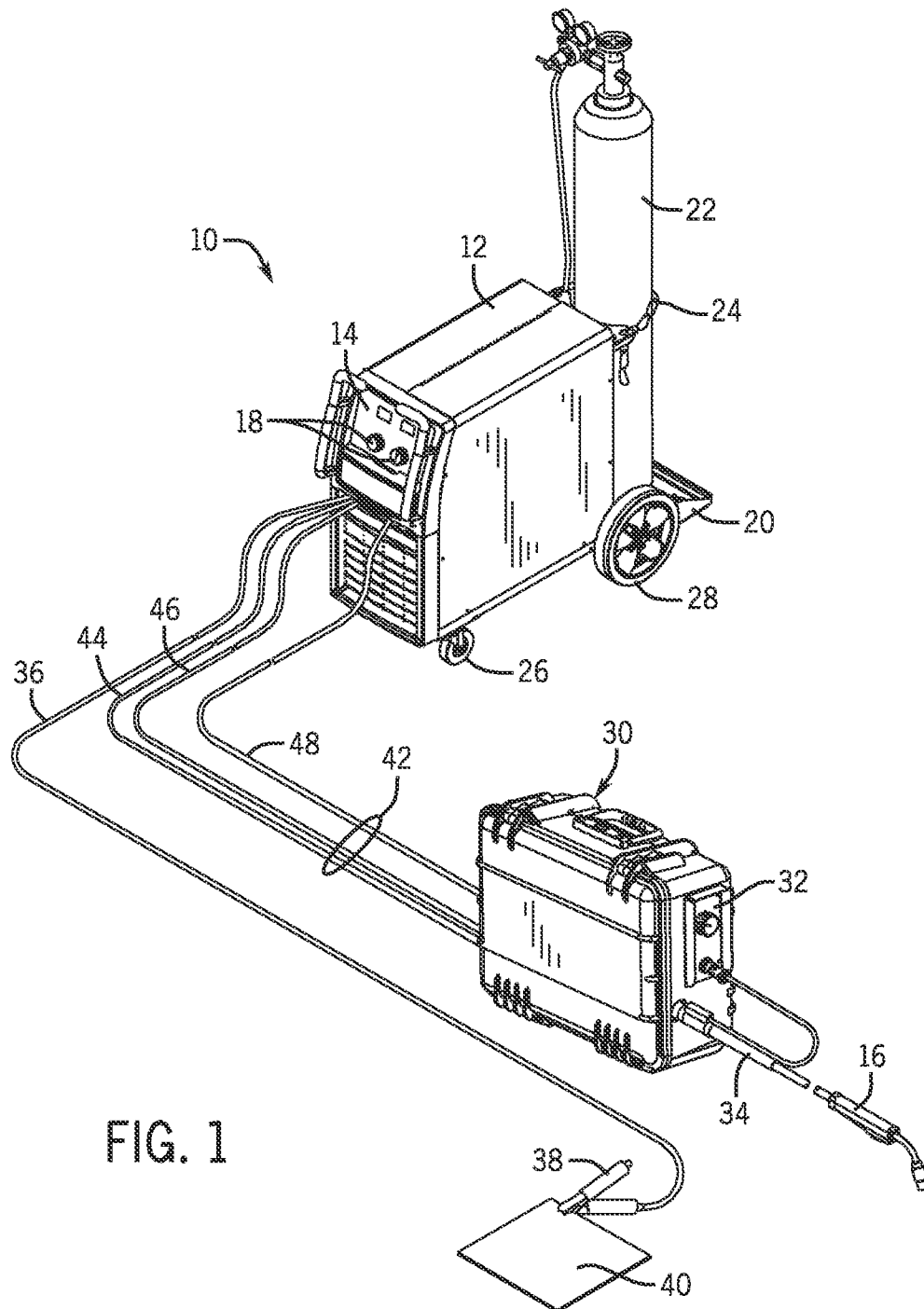
a welding power supply unit having an auxiliary power supply configured to supply power to an auxiliary power load connected to the auxiliary power supply; and control circuitry configured to:

detect a voltage received by the auxiliary power load from the auxiliary power supply;

compare an output voltage generated by the auxiliary power supply with the voltage received by the auxiliary power load; and

apply a correction factor to the output voltage from the auxiliary power supply based at least in part on the comparison of the output voltage generated by the auxiliary power supply and the voltage received by the auxiliary power load.

1 / 4



2 / 4

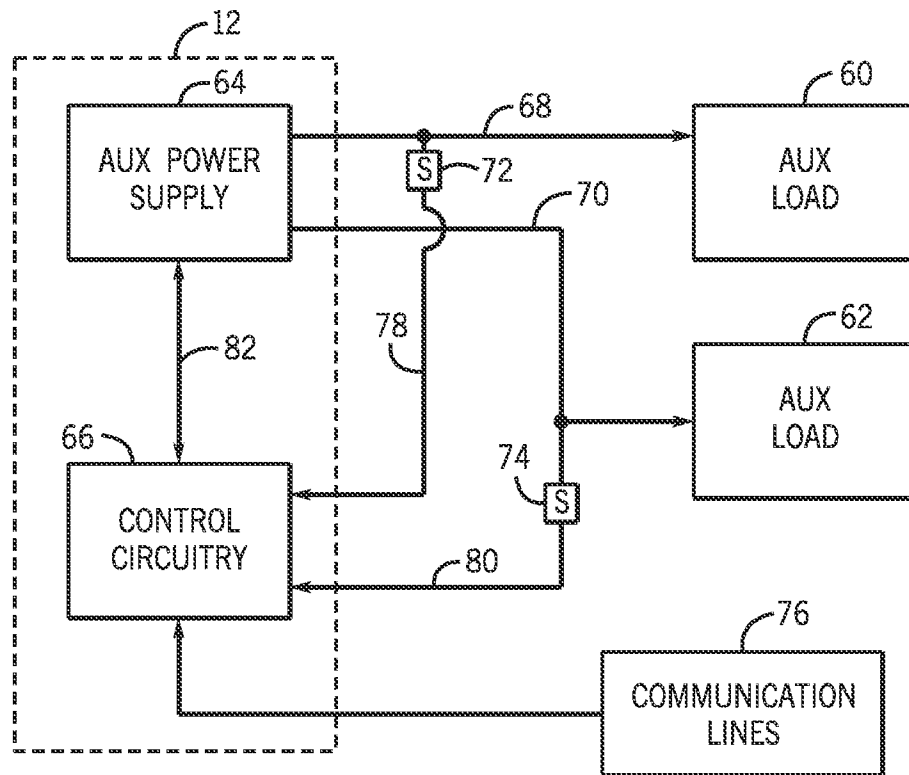


FIG. 2

3 / 4

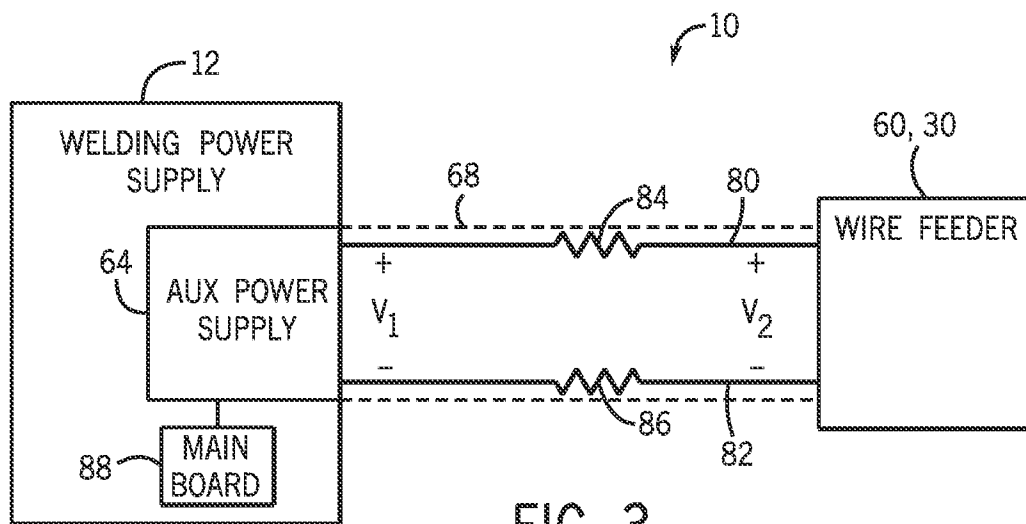


FIG. 3

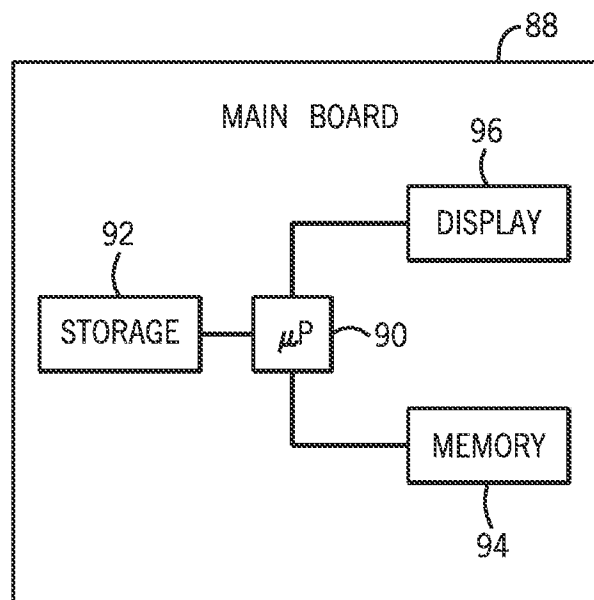


FIG. 4

4 / 4

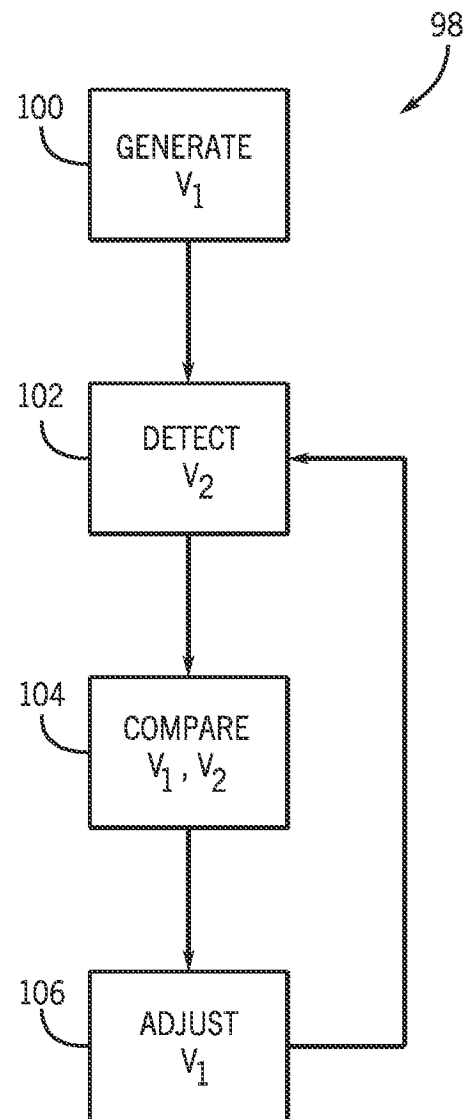


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/030108

A. CLASSIFICATION OF SUBJECT MATTER

INV. B23K9/095 B23K9/173 B23K9/32 B23K9/10
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2010/320183 A1 (N. M. BORCHERT ET AL) 23 December 2010 (2010-12-23) paragraphs [0003], [0023] - [0025], [0030]; figures -----	1-20
Y	US 2007/080154 A1 (B. L. OTT ET AL) 12 April 2007 (2007-04-12) paragraph [0074]; figures -----	1-20
Y	US 2010/308027 A1 (B. J. VOGEL) 9 December 2010 (2010-12-09) paragraphs [0034] - [0037], [0067]; figures -----	6,7,15, 16
A	US 2007/181547 A1 (B. J. VOGEL ET AL) 9 August 2007 (2007-08-09) paragraphs [0063], [0068], [0071]; figures ----- -/-	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

20 June 2012

Date of mailing of the international search report

29/06/2012

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Jeggy, Thierry

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/030108

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006/086706 A1 (J. F. ULRICH) 27 April 2006 (2006-04-27) paragraph [0044]; figures -----	1-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/030108

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010320183	A1	23-12-2010	NONE
US 2007080154	A1	12-04-2007	EP 1986811 A2 05-11-2008 US 2007080154 A1 12-04-2007 WO 2007100480 A2 07-09-2007
US 2010308027	A1	09-12-2010	CA 2764355 A1 09-12-2010 CN 102458748 A 16-05-2012 EP 2437909 A2 11-04-2012 US 2010308027 A1 09-12-2010 WO 2010141435 A2 09-12-2010
US 2007181547	A1	09-08-2007	CN 101374627 A 25-02-2009 EP 1981676 A1 22-10-2008 EP 2319650 A2 11-05-2011 US 2007181547 A1 09-08-2007 WO 2007094896 A1 23-08-2007
US 2006086706	A1	27-04-2006	US 2006086706 A1 27-04-2006 US 2008116176 A1 22-05-2008