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(54) **Title**: SYSTEM FOR WELDING, WIRE DRIVE SYSTEM AND METHOD OF SWITCHING THE SOURCE OF ELECTRICAL POWER WITH WIRE FEEDER HAVING AUTOMATIC CONFIGURATION OF POWER SUPPLY

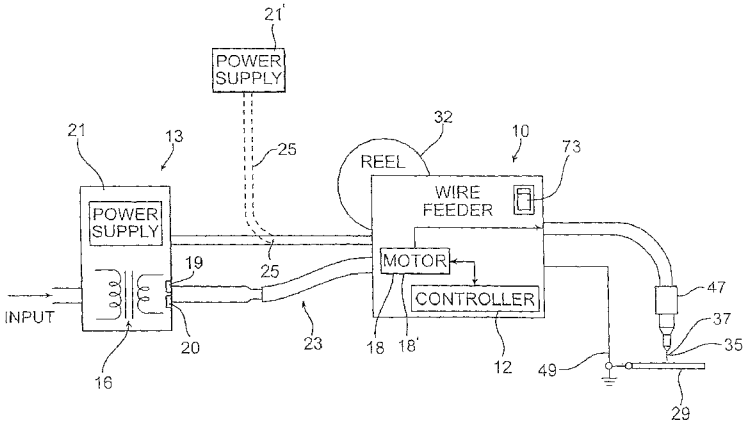

FIG. 1

(57) **Abstract**: A wire drive system (10) includes a wire feed motor (18) for feeding welding wire (35) in a continuous welding process. The wire drive system (10) further includes a controller (12) connected to the wire feed motor (18) for driving the motor (18) responsive to a command signal. The controller (12) is capable of detecting the source (21, 21', 16) of power from which the wire feed motor (18) is driven wherein a first possible source of power (16) is taken from the welding arc and wherein a second possible source of power (21, 21') is taken from the welding power supply.

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SYSTEM FOR WELDING, WIRE DRIVE SYSTEM AND METHOD OF SWITCHING THE SOURCE OF ELECTRICAL POWER WITH WIRE FEEDER HAVING AUTOMATIC CONFIGURATION OF POWER SUPPLY

TECHNICAL FIELD

[0001] The present invention pertains to wire feeders for welding power supplies, and more particularly, to wire feeders that automatically switch between power sources.

BACKGROUND OF THE INVENTION

[0002] Wire feeders are commonplace in the field of welding. As is well known, they are used in conjunction with a welding power source for feeding a wire electrode to a work-piece during the welding process. The electrode may include solid wire, which in some instances is coated depending on the application. Other applications utilize flux cored wire. The wire is continuously fed at a rate which may vary during the welding process. Such processes include, for example, inner shield welding, outer shield welding, short arc and flux cored arc welding.

[0003] Manufacturers construct welding accessories for use with a particular application or a specific type of welding machine. In the case of wire feeders, it is known for a manufacturer to construct a unit which draws power from the welding arc. These types of wire feeders may be especially useful for construction site or field use where welding frequently occurs away from the welding power source. Other wire feeders draw power from a separate regulated power supply, since some applications require greater precision and may be adversely affected by power drawn from across the arc. Pulse welding is one example. This type of wire feeder utilizes a separate cable to conduct power from the regulated power supply, which may reside in the welder. In the present state of the art, these systems are not directly interchangeable.

[0004] In order to meet the diverse needs of the industry, a company, e.g. a construction company or a rental company, may stock different types of wire feeders. However, this represents not only a significant capital investment, but the additional equipment also takes up storage space. It is possible to convert one type of wire feeder to another by installing a kit, which addresses the problem of stocking or transporting multiple units. Although, valuable productivity is lost when time is taken to modify the unit. Additionally, once converted, the ability to draw power from the alternate power source is lost.

[0005] Rather than purchasing or stocking multiple units for different applications or installing conversion kits, it would be beneficial and cost effective to have a single wire feeder

that automatically switches power sources based on the welding application. In view of the current state of the art, there is a need for a wire feeder that can automatically draw power from between different sources, whether it is power drawn from a separate welding power supply or power drawn from the welding arc. The embodiments of the present invention obviate the aforementioned problems.

BRIEF SUMMARY

[0006] The embodiments of the present invention are directed to devices and methods of arc welding, including wire feeder drive systems that can be easily connected to receive power from different power sources and from different types of arc welders without having to significantly modify the wire feeder. The invention will be described with particular reference to wire feeders in association with MIG or TIG welders. However, it will be appreciated by persons of ordinary skill in the art that the embodiments described herein can be utilized in any type of welder requiring a continuous feed of wire. The wire feeder may include electrical circuitry that can detect and activate the wire drive system responsive to different sources of power as, for example, from a regulated power supply or from the welding arc.

[0007] In one embodiment of the present invention, a system for welding includes a welding power source operable to deliver electrical power for establishing a welding arc, a wire feeder including a wire feeder motor for continuously feeding an associated electrode, and a controller operable to automatically direct power for operating the wire feeder motor from between a first power source and at least a second substantially different power source.

[0008] In one aspect of the embodiments of the subject invention, power from the first power source is taken from across the welding arc, and the second substantially different power source is a separate regulated power supply.

[0009] In another aspect of the embodiments of the subject invention, the system may include a power cable for communicating electrical power from the separate regulated power supply to the controller.

[0010] In yet another aspect of the embodiments of the subject invention, the separate regulated power supply is integrated into the welding power source.

[0011] In still another aspect of the embodiments of the subject invention, when power is detected on the power cable, the controller automatically switches from power fed to the wire feeder motor from the welding arc to power fed to the wire feeder motor from the separate regulated power supply.

[0012] In even another aspect of the embodiments of the subject invention, when the power cable is disconnected from the controller, the controller automatically switches from power fed to the wire feeder motor from the separate regulated power supply to power fed to the wire feeder motor from the welding arc.

[0013] In one aspect of the embodiments of the subject invention, the system includes means for detecting connection of the power cable to the controller.

[0014] In even another aspect of the embodiments of the subject invention, means for detecting connection of the power cable comprises a sensing circuit connected between the controller and the power cable.

[0015] In still another aspect of the embodiments of the subject invention, the system includes a logic processor having an input and at least a first output for automatically controlling power for driving the wire feeder motor from between the welding arc and the separate regulated power supply.

[0016] In another aspect of the embodiments of the subject invention, means for detecting connection of the power cable includes an output, where the output from said means for detecting connection of the power cable is operatively connected to the input of the logic processor.

[0017] In yet another aspect of the embodiments of the subject invention, the system includes at least a first switch for selectively establishing an electrical connection between the separate regulated power supply and the wire feeder motor, where the at least a first switch is activated responsive to the at least a first output of the logic processor.

[0018] In still yet another aspect of the embodiments of the subject invention, the at least a first switch comprises a control relay having at least a first set of contactors.

[0019] In one embodiment of the present invention, a wire drive system for use with an associated welding power source includes a drive motor for feeding associated wire and a

drive motor controller operatively connected to the drive motor for automatically directing electrical supply power to the drive motor from between a first power source and at least a second substantially different power source.

[0020] In one aspect of the embodiments of the subject invention, power from the first power source is drawn from an associated welding arc, and/or power from the at least second power source is drawn from an external regulated power supply.

[0021] In another aspect of the embodiments of the subject invention, the wire drive system includes means for detecting a threshold level of power from the at least a second substantially different power supply, where said means for detecting a threshold level of power may advantageously comprise at least a first electrical circuit for detecting an output or voltage potential from the at least a second substantially different power supply.

[0022] In another aspect of the embodiments of the subject invention, the at least a first electrical circuit comprises a rectifying circuit.

[0023] In another embodiment, a method of switching the source of electrical power supplied to the wire feeder motor from a welding wire feeder system includes the steps of providing a welding wire feeder system operable to draw power from an associated welding arc for operating the wire feeder motor, where the welding wire feeder system is also operable to receive power for operating the wire feeder motor from a separate regulated power supply, connecting power from the separate regulated power supply to the welding wire feeder system, and automatically drawing power from the separate regulated power supply to operate the wire feeder motor.

[0024] In one aspect of the embodiments of the subject invention, disconnecting power of the separate regulated power supply from the welding wire feeder system thereby automatically switches power drawn to operate the wire feeder motor from the separate regulated power supply to power drawn from the associated welding arc to operate the wire feeder motor.

Further embodiments are inferable from the following description, drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIGURE 1 is a schematic representation of welding power source and wire feeder according to the embodiments of the present invention.

[0026] FIGURE 2 is a schematic wiring diagram of the wire feeder motor and the controller according to the embodiments of the present invention.

[0027] FIGURE 3 is a block diagram schematically showing the control and flow of power to the wire feeder according to the embodiments of the present invention.

[0028] FIGURE 4 is a schematic representation of one embodiment of a sensing circuit.

[0029] FIGURE 5 is a schematic representation of a switching circuit according to the embodiments of the present invention.

[0030] FIGURE 6 is a schematic representation showing contactors according to the embodiments of the present invention.

[0031] FIGURE 7 is a partial perspective view of a cable for communicating power to the wire feeder from a regulated power supply according to the embodiments of the present invention.

[0032] FIGURE 8 is a schematic representation of a rectifying circuit according to the embodiments of the present invention.

[0033] FIGURE 9 is a block diagram showing the steps of connecting power to the wire feeder from between first and second substantially different power sources according to the embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0034] Referring now to the drawings wherein the showings are for purposes of illustrating embodiments of the invention only and not for purposes of limiting the same, FIGURE 1 shows a wire feeder depicted generally at 10. The wire feeder 10 may be used in conjunction with a welding power source 13 as manufactured by, for example, the Lincoln Electric company in Cleveland, Ohio. The welding power source 13 may receive electrical input power from an outside source that is directed to a transformer 16 having primary and sec-

ondary windings in a manner well known in the art. Output from the secondary windings may be directed to a rectifier, not shown, providing DC supply power to the output terminals or studs 19, 20. It is noted that in an alternative embodiment, output power from the welding power supply may be supplied in the form of AC type power. The welding power source 13 may include a power controller, not shown, designed to control output power at the studs 19, 20. In one mode of operation, the power controller may function to maintain constant current; useful in certain manual applications where arc length varies. Conversely, the power controller may operate in a constant voltage mode. The welding power source 13 may additionally include a separate regulated power supply 21 for delivering electrical power to a welding accessory, which may be a wire feeder 10 as will be discussed further in a subsequent paragraph. Welding cables, designated generally at 23, may be connected to the welding power source 13, and more specifically to the studs 19, 20 for delivering welding current to a work piece 29 through an electrode 35 and work piece connector 49. The electrode 35 may include welding wire 37 supplied from a continuous source and fed through the wire feeder 10. The welding cables 23 may be connected through the wire feeder 10 as shown in FIGURE 1. In one embodiment, the wire feeder 10 may draw power to operate the wire feeder motor 18 from the open circuit voltage of the welding power source 13 and subsequently through closed circuit voltage once the welding arc has been established. In another embodiment, power to operate the wire feeder 10 may come from the separate regulated power supply 21. An external cable 25 may be required to connect electrical power to the wire feeder 10 from the regulated power supply 21. It is noted that the embodiments of the subject invention are not limited to the type of welding power source 13 and/or power controller. Rather, any type of welding power source 13 may be utilized that functions to allow power to be taken from across the arc for operating the wire feeder motor 18.

[0035] With continued reference to FIGURE 1 and now also to FIGURES 2 and 3, the wire feeder 10 may include a wire feeder motor 18, also termed drive motor 18, which feeds the welding wire 37 drawn from a continuous source like a wire reel 32 or drum. A wire feeder controller 12 may also be incorporated to control the drive motor 18 along with other components of the wire feeder 10, like for example a gas solenoid or other circuitry. In one embodiment, an on-board power supply, not shown, may be included that filters and stores operating power from across the arc for use by various electrical circuits during intervals of time when available operating voltage falls below a minimum level, which may be 35 Volts. It is noted that power may be stored in one or more sets of capacitors as needed.

Prior to welding, i.e. establishing an arc, the open circuit voltage may supply power to the on-board power supply, as well as to the drive motor 18. During welding, an arc is established between the electrode 35 and workpiece 49, and the closed circuit voltage supplies power to the wire feeder 10. At times, available power may be less than the requisite minimum, in which case power from the capacitors may then be used.

[0036] Welding parameters frequently change due to fluctuations in the work piece configuration and/or the electrode position. As a result, the rate at which welding wire 37 is fed through the welding gun 47 may change. Accordingly, the drive motor 18 may be a variable speed drive motor 18 for feeding the wire electrode at different rates. In one embodiment, the drive motor 18 may be a variable speed DC drive motor 18'. Power supplied to the drive motor 18 may be modulated to control its speed. In an exemplary manner, Pulse Width Modulation may be used to control the speed of the drive motor 18 via one or more switching circuits, which may comprise power MOSFETs or any other switching device chosen with sound engineering judgment. The switching circuits may be included within wire feeder controller 12 for switching power on and off to the drive motor 18 in a series of pulses. The switching circuits may function to rapidly switch power to drive motor 18 from between substantially zero volts to a nominal operating voltage in a series of pulsed waves. Varying the duty cycle of this signal, i.e. the amount of time that the pulsed waves are on relative to how long it is off, alters the average power delivered to the drive motor 18. In this way, the wire feeder controller 12 adjusts the speed of the drive motor 18 by selectively controlling activation of the switching circuits. However, it is contemplated that other types of drive motors and motor controllers may be used to control the speed of the drive motor 18 including but not limited to AC drive motors and variable frequency drive controllers.

[0037] With reference to Figures 1 and 7, a power cable 25 may be utilized to communicate power from the power supply 21 for operating the drive motor 18. As previously noted, the power supply 21 may be located within the welding power source 13. Accordingly, the power supply 21 may draw power from the output of the transformer 16 and further condition or regulate that power for use by the drive motor 18 in a manner consistent with the embodiments described herein. In one embodiment, the regulated power supply 21 may deliver substantially 42 V_{AC}. Alternative embodiments are contemplated where a power supply 21' is distinctly separate from the welding power source 13. The separate power supply unit 21' may draw power from any external source, regulating its output in a similar manner. In either type of supply 21 or 21', power to operate to the drive motor 18

may be communicated through the power cable 25, which may include one or more electrical conductors and respective connector ends 27. Accordingly, power to operate the drive motor 18 may be drawn from one of multiple disparate power sources.

[0038] With reference now to Figures 1, 3 and 8, in one mode of operation, power from a first source may be taken directly from across the welding arc, i.e. the open circuit and closed circuit voltage of the studs 19, 20. Separately, power from a second source may be taken from a regulated power supply 21 or 21'. However, both sources of operating power may be channeled through the wire feeder controller 12. Power from each source may be conditioned before reaching the drive motor 18. In one embodiment, power from each source may be rectified before reaching the wire feeder controller 12. In an exemplary manner, Figure 8 shows first 40 and second 41 bridge rectifiers that connect to the power sources via connectors 42 and 43 respectively. Subsequently, the rectified power may be filtered as accomplished by on-board capacitors, which may also be used to store supply power during time periods when supply power falls below the requisite minimum. The rectified and filtered power may then be directed to the wire feeder controller 12 for modulation as described above. It is to be understood that any other means of conditioning the power, and more specifically rectifying the power, may be chosen with sound engineering judgment.

[0039] With reference now to FIGURES 2 and 3, the wire feeder controller 12 may include a logic processor 55 for controlling operation of the wire feeder 10. The logic processor 55 may perform logical operations on the input data and output timing or sequencing information for operating the wire feeder components. In one embodiment, the logic processor 55 may comprise a microprocessor 55' incorporating circuitry that can be programmed to execute a succession of instructions. The microprocessor 55' may be accompanied by additional support circuitry as needed, like for example static and dynamic memory. Although, any type peripheral support circuitry may be included as is appropriate for use with the embodiments of the subject invention. As mentioned above, the wire feeder controller 12 may activate, or deactivate, the switching circuits (not shown in the figures) used to adjust the speed of the drive motor 18. In one embodiment, the logical processor 55 may control output to the switching circuits as well as other components of the wire feeder 10 as will be discussed further below. It is noted that any number of logic processors or any circuit configuration of logic processors may be incorporated into the wire

feeder controller 12 without departing from the intended scope of coverage of the embodiments of the subject invention.

[0040] With reference now to Figures 3 and 4, a sensing circuit 60 may be situated between the wire feeder controller 12 and the regulated supply power 21 or 21'. In particular, the sensing circuit 60 may be incorporated into the wire feeder controller 12, and more specifically into the logic processor 55. However, the configuration and location of the sensing circuit 60 should not to be construed as limiting. Rather any physical representation of the sensing circuit 60 may be chosen with sound engineering judgment. The sensing circuit 60 may include one or more inputs 63 and may have at least one output 66. In an exemplary manner, the input to the sensing circuit 60 may be taken from the conductors of the power cable 25 and the output 66 may be electrically communicated to the logic processor 55. In this way, the sensing circuit 60 may function to detect the presence or absence of electrical power on the power cable 25 and subsequently signal the logic processor 55 to respond accordingly by switching between the first and second power sources, as will be discussed further below.

[0041] With continued reference to Figures 3 and 4, as mentioned, the one or more inputs 63 of the sensing circuit 60 may be electrically connected to the power cable 25. That is to say that the voltage potential across the conductors of the power cable 25 may comprise the input to the sensing circuit 60. The sensing circuit 60 may include one or more circuit portions that condition the input signal. In one embodiment, the sensing circuit 60 may include a rectifying circuit 61 that inverts the input signal and a voltage divider circuit 62 that scales the signal to within a predetermined range. The conditioned signal may then be compared to a predetermined value for subsequent output to the logic processor 55. In an exemplary manner, the scaled signal may be compared to a threshold voltage, which may be 5 Volts. As such, the output of the sensing circuit 60 may comprise a logical "true" or "false" based on the comparison of the conditioned input signal with the threshold voltage. It is noted that the threshold voltage may correspond to the minimum voltage needed to operate the drive motor 18. The default output signal from sensing circuit 60 may comprise a logical zero (0) or "off," which corresponds to an input signal (i.e. power cable voltage) that falls below the threshold voltage. Conversely, a logical one (1) or "on" represents voltage on the power cable 25 that meets or exceeds the threshold voltage. Stating it another way, a logical zero (0) may indicate that the power cable 25 is not connected to the wire feeder 10, while a logical one (1) indicates that the power cable 25 is connected and

operable to deliver power to operate the drive motor 18. Thus, the sensing circuit 60 functions to detect when the power cable 25 is connected or disconnected from the wire feeder 10. It will be appreciated that when the operator electrically connects the power cable 25 to the wire feeder 10, the wire feeder controller 12 automatically detects the presence of the alternate power source and automatically switches the source of power supplied to the drive motor 18. It follows that when the operator disconnects the power cable 25, the sensing circuit 60 detects that power is no longer available from the alternate or second power source and signals the wire feeder controller 12 to switch the power supplied to the drive motor 18 back to the first source of electrical power. It is to be construed that the sensing circuit 60, and in particular the signal conditioning circuit portions, as described herein are exemplary in nature. Others circuit configurations and/or sensors may be realized and implemented that fall within the scope of the appended claims. It is also noted that the output of the sensing circuit is discrete in nature, namely "on" or "off" indicating the status of supply power from the power cable 25. Still other embodiments are contemplated where a magnitude of the available power, i.e. voltage level, on the power cable 25 is communicated to the logic processor and/or to the operator via a display.

[0042] With reference now to Figures 6 and 8, a set of contactors 67 may be employed to switch power being supplied to the drive motor 18 from across the arc to the regulated power supply 21 or 21'. As illustrated in Figure 8, power from the power cable 25 may flow through connector 43 to a rectifying circuit 41. The rectified signal may then flow through the set of contactors 67 (reference Figure 6) and subsequently through connector 42 where power from either source may be directed to the drive motor 18 in a manner consistent with that described above. When power is being drawn from across the arc, the contactors 67 may be open and thereby incapable of electrically conducting power from the power cable 25. When activated by the wire feeder controller 12, the contactors 67 close, thus establishing conductivity through connector J9 for delivering power to drive motor 18. It is to be understood that the particular circuit configuration of connectors described herein is exemplary in nature and not to be construed as limiting. Other configurations may be realized by persons of ordinary skill in the art without limiting the scope of coverage of the embodiments of the subject invention.

[0043] With reference once again to Figures 3 and 6 and now also to Figure 5, the contactors 67 may be selectively energized by an electrical switch, illustrated generally at 75. In one embodiment, the electrical switch 75, also termed switch 75, may include a solid

state device like for example a transistor 77, which may be connected in series with one or more coils 69. Although, it will be appreciated that any type of electrical switch 75 or switching circuit may be utilized; solid state or otherwise. The coils 69 may be electromagnetically coupled to the contactors 67 and thus activated or deactivated in synchronous with the coils 69. The coils 69 and contactors 67 therefore comprise a control relay. In the current embodiment, two (2) control relays are utilized, CR1, CR2; one for each leg of the power circuit. Power drawn from the transistor 77 flows through the circuit thereby energizing the coils 69 and activating the contactors 67 in a manner well known in the art. The trigger to the switch 75, or the transistor 77 as in the current embodiment, may be input from the logic processor 55. When signaled by the sensing circuit 60 that the power cable 25 is present and active with available power, the logic processor 55 may output a signal that triggers the switch 75, and consequently the contactors 67, to establish an electrical path between the regulated power supply 21 or 21' and the drive motor 18. Likewise, when the power cable 25 is disconnected, the logic processor 55 triggers the switch 75 to open the contactors 67 thus inhibiting the flow of power from the power cable 25. It should be realized that the electrical circuit as established between the studs 19, 20 of the welding power source 13 and the drive motor 18 remain connected in every circumstance. However, persons of ordinary skill in the art will understand that power is drawn from across the arc only when the power cable 25 is disconnected.

[0044] With reference to all of the Figures, operation of the wire feeder 10 will now be discussed. The wire feeder 10 may be connected to the welding power source 13 via the welding cables 23. Power for operating the wire feeder 10 may be taken directly from studs 19, 20, first from the open circuit voltage and subsequently from the studs after the welding arc has been struck. In this manner, the wire feeder 10 operates in a first mode, or default mode of operation. When the operator connects the power cable 25 from the regulated power supply 21, 21' to the wire feeder 10, the wire feeder controller 12 via the sensing circuit 60 detects the presence of the second power source and automatically connects or switches to that source of power for operating the drive motor 18. The wire feeder 10 thereby operates in a second mode of operation. The reverse situation also applies. When the operator disconnects the power cable 25, the wire feeder controller 12 switches the source of supply power to re-establish the supply of power from across the arc.

[0045] The invention has been described herein with reference to the preferred embodiment. Obviously, modifications and alterations will occur to others upon a reading and un-

derstanding of this specification. It is intended to include all such modifications and alternations insofar as they come within the scope of the appended claims or the equivalence thereof.

Reference numbers:

10	wire feeder	47	welding gun
12	wire feeder controller	49	work piece connector
13	welding power source	55	logic processor
16	transformer	55′	microprocessor
18	wire feeder motor	60	circuit
19	stud	61	rectifying circuit
20	stud	62	divider circuit
21	regulated power supply	63	inputs
21′	power supply	66	output
23	welding cables	67	contactors
25	external cable	69	coils
27	connector end	75	electrical switch
29	work piece	77	transistor
32	wire reel		
35	electrode	CR1	control relay
37	welding wire	CR2	control relay
40	first bridge rectifier	J9	connector
41	second bridge rectifier		
42	connector		
43	connector		

CLAIMS

1. A system for welding, comprising:

a welding power source operable to deliver electrical power for establishing a welding arc;

a wire feeder (10) including a wire feeder motor (18) for continuously feeding an associated electrode (35); and,

a controller (12) operable to automatically direct power for operating the wire feeder motor (18) from between a first power source and at least a second substantially different power source.

2. The system as defined in claim 1, wherein power from the first power source is taken from across the welding arc, and

wherein the second substantially different power source is a separate regulated power supply (21); and further comprising:

a power cable (25) for communicating electrical power from the separate regulated power supply (21) to the controller (12).

3. The system as defined in claim 1 or 2, wherein the separate regulated power supply is integrated into the welding power source.

4. The system as defined in claim 2 or 3, wherein when power is detected on the power cable (25), the controller (12) automatically switches from power fed to the wire feeder motor (18) from the welding arc to power fed to the wire feeder motor (18) from the separate regulated power supply; and/orwhen the power cable (25) is disconnected from the controller (12), the controller (12) automatically switches from power fed to the wire feeder motor (18) from the separate regulated power supply to power fed to the wire feeder motor (18) from the welding arc.

5. The system as defined in one of the claims 1 to 4, further comprising:

means for detecting connection of the power cable (25) to the controller (12).

6. The system as defined in claim 5, wherein said means for detecting connection of the power cable (25) comprises a sensing circuit (60) connected between the controller (12) and the power cable (25).

7. The system as defined in claim 5 or 6, wherein the controller further comprises:

a logic processor (55) having an input and at least a first output for automatically controlling power for driving the wire feeder motor (18) from between the welding arc and the separate regulated power supply.

8. The system as defined in claim 7, wherein said means for detecting connection of the power cable includes an output; and,

wherein the output from said means for detecting connection of the power cable is operatively connected to the input of the logic processor (55).

9. The system as defined in claim 7 or 8, further comprising:

at least a first switch (73) for selectively establishing an electrical connection between the separate regulated power supply and the wire feeder motor (18); and,

wherein the at least a first switch (73) is activated responsive to the at least a first output of the logic processor (55).

10. The system as defined in claim 9, wherein the at least a first switch comprises a control relay having at least a first set of contactors.

11. A wire drive system for use with an associated welding power source, comprising:

a drive motor (18) for feeding associated wire; and,

a drive motor controller (12) operatively connected to the drive motor (18) for automatically directing electrical supply power to the drive motor (18) from between a first power source and at least a second substantially different power source.

12. The wire drive system as defined in claim 11, wherein power from the first power source is drawn from an associated welding arc; and/orpower from the at least a second power source is drawn from an external regulated power supply.

13. The wire drive system as defined in claim 11 or 12, further comprising:

means for detecting a threshold level of power from the at least a second substantially different power supply.

14. The wire drive system as defined in claim 13, wherein said means for detecting a threshold level of power comprises:

at least a first electrical circuit for detecting an output from the at least a second substantially different power supply.

15. The wire drive system as defined in claim 14, wherein the at least a first electrical circuit comprises a rectifying circuit (40, 41).

16. The wire drive system as defined in one of the claims 13 to 15, further comprising: a logic processor (55) operatively communicated to said means for detecting a threshold level of power having a logic processor output; and,

wherein the drive motor controller is operable to automatically direct electrical supply power to the drive motor from between a first power source and at least a second substantially different power source responsive to the logic processor (55) output.

17. A method of switching the source of electrical power supplied to the wire feeder motor of a welding wire feeder system, comprising the steps of:

providing a welding wire feeder system operable to draw power from an associated welding arc for operating the wire feeder motor (18), wherein the welding wire feeder system is operable to receive power for operating the wire feeder motor (18) from a separate regulated power supply;

connecting power from the separate regulated power supply to the welding wire feeder system; and,

automatically drawing power from the separate regulated power supply to operate the wire feeder motor (18) in replacement of drawing power from an associated welding arc.

18. The method as defined in claim 17, further comprising the steps of:

disconnecting power of the separate regulated power supply from the welding wire feeder system thereby automatically switching power drawn to operate the wire feeder motor (18) from the separate regulated power supply to power drawn from the associated welding arc to operate the wire feeder motor (18).

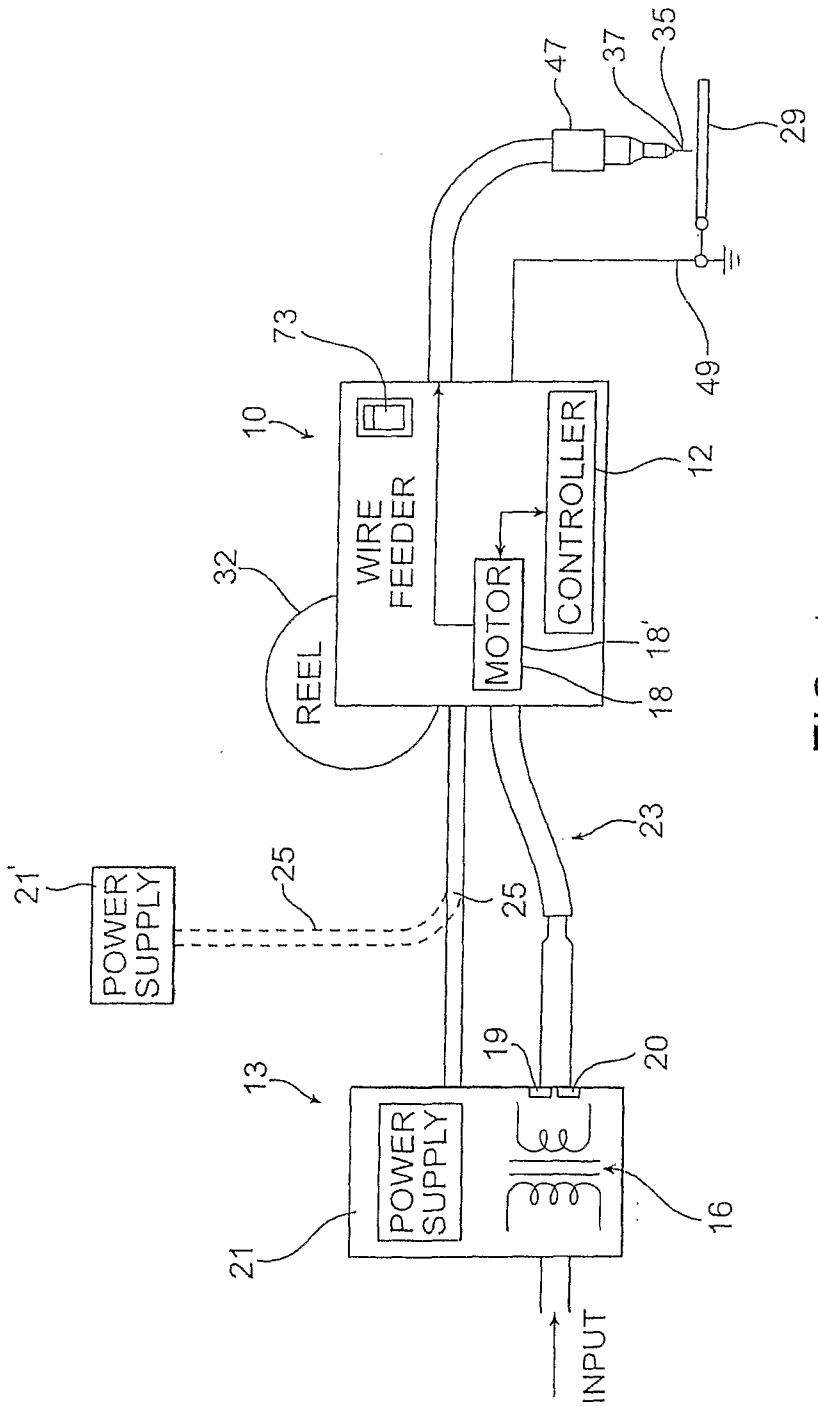
47
37
35
29
49
73
10
WIRE FEEDER
CONTROLLER
12
32
MOTOR
18'
18
REEL
23
21'
POWER SUPPLY
25
25
19
20
13
POWER SUPPLY
16
21
INPUT

FIG. 1

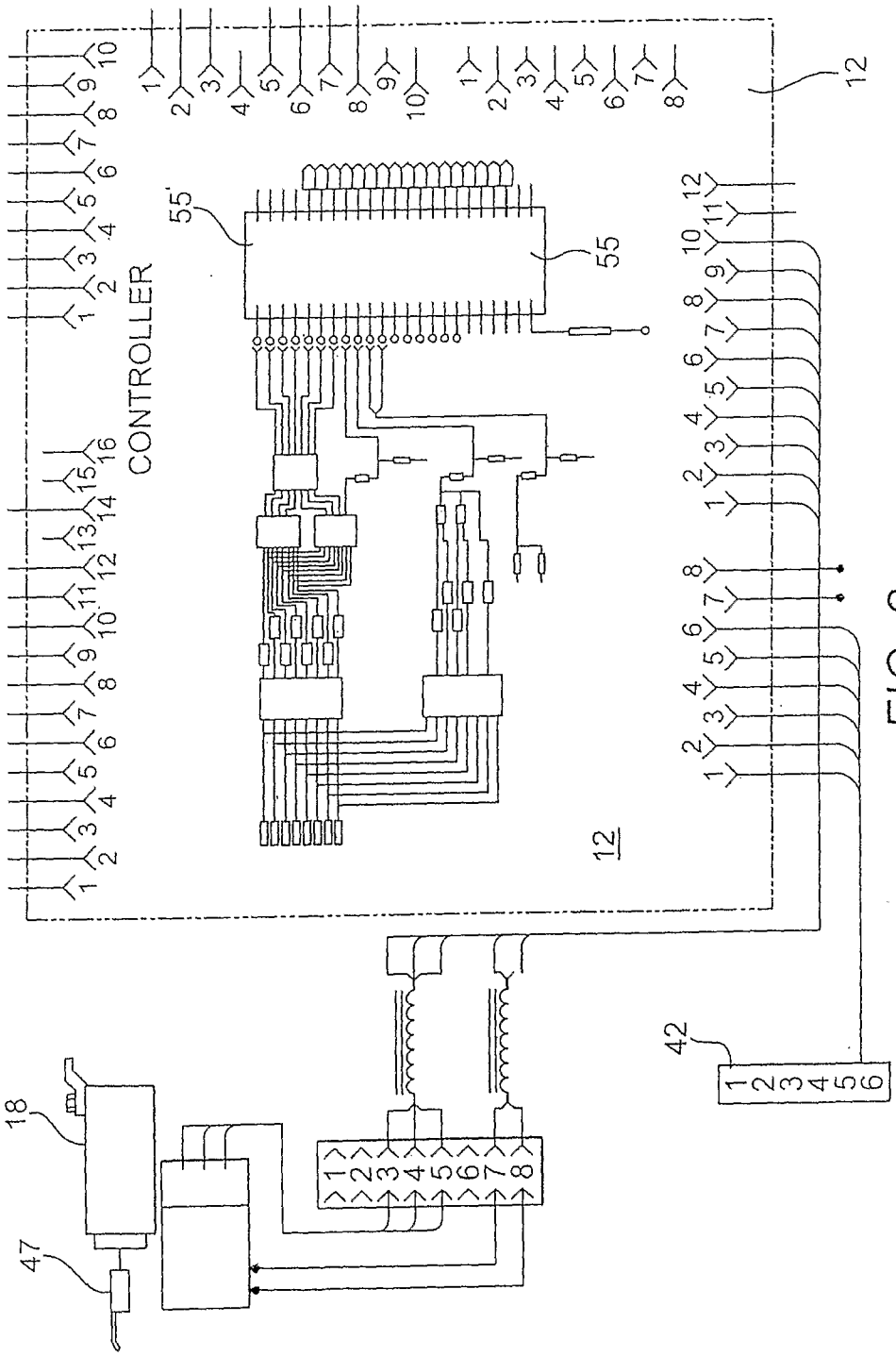

FIG. 2

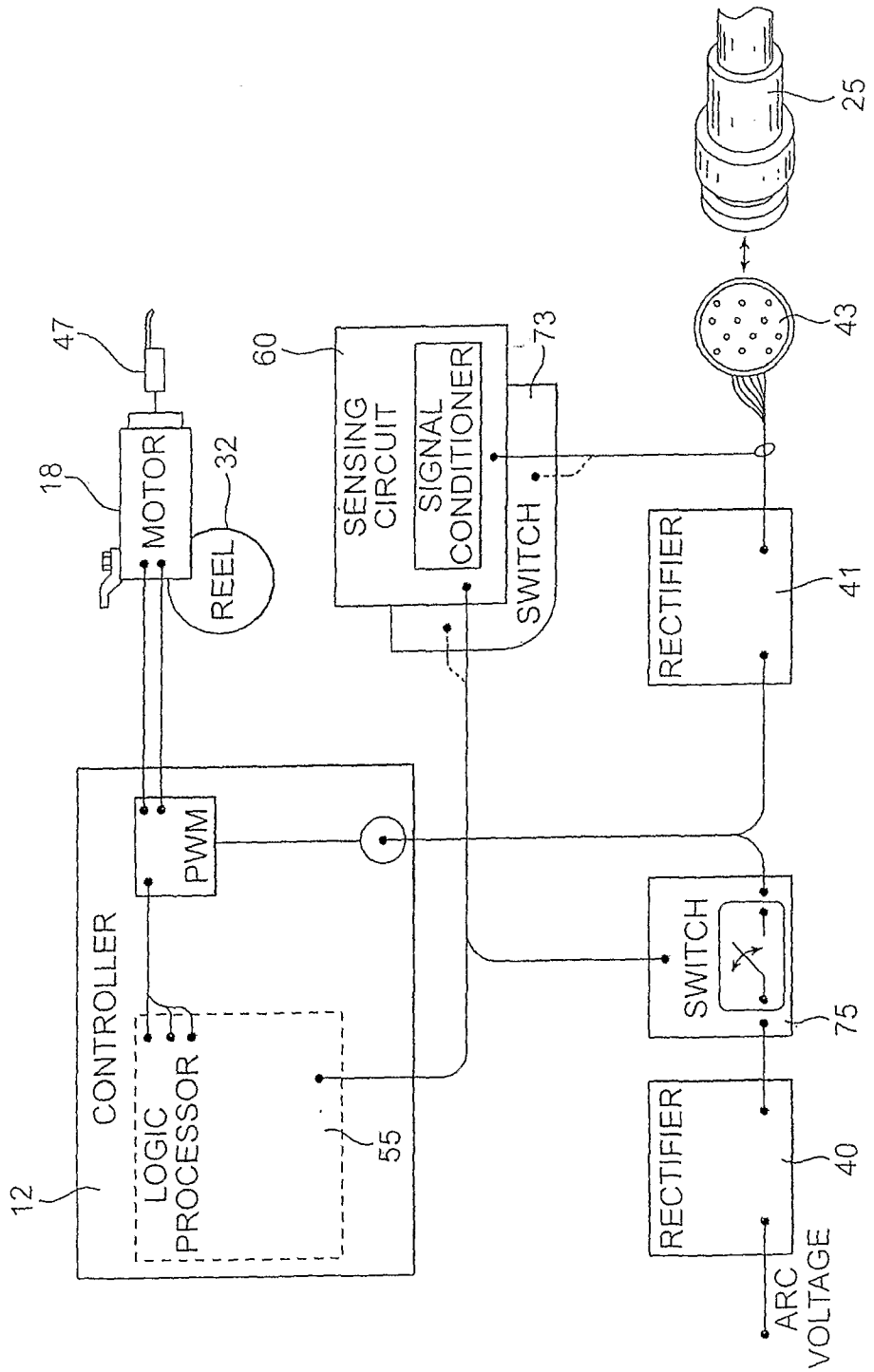
CONTROLLER
LOGIC PROCESSOR
PWM
MOTOR
REEL
SENSING CIRCUIT
SIGNAL CONDITIONER
SWITCH
RECTIFIER
RECTIFIER
SWITCH
ARC VOLTAGE
12
18
32
47
60
73
41
40
75
55
43
25

FIG. 3

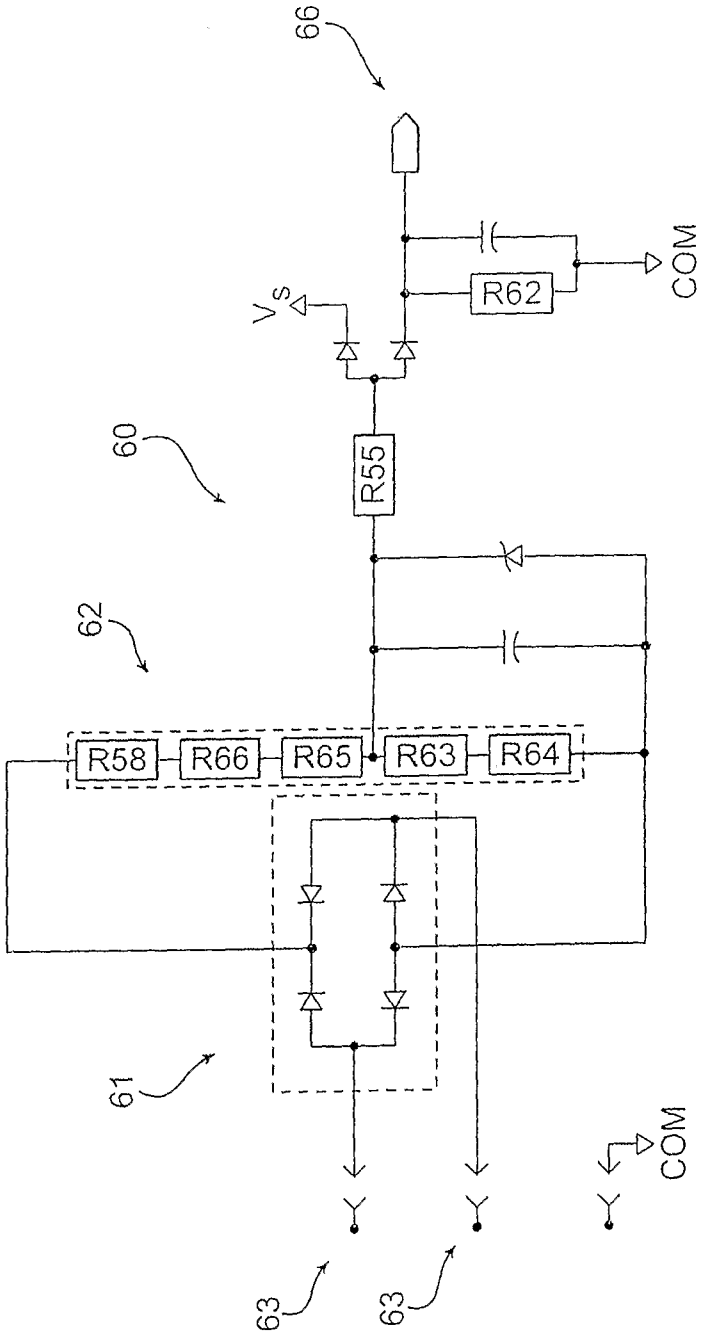

FIG. 4

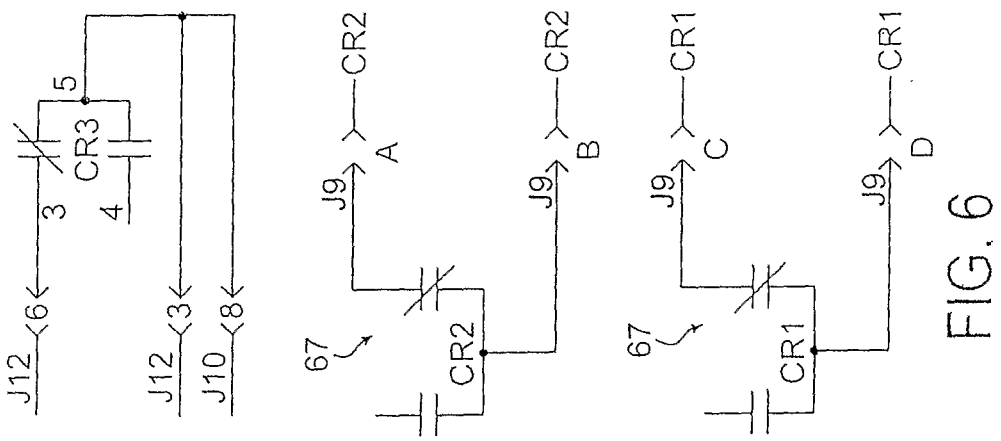
J12
6
3
CR3
4
5
J12
3
J10
8
J9
CR2
A
67
CR2
J9
CR2
B
J9
CR1
C
67
CR1
J9
CR1
D

FIG. 6

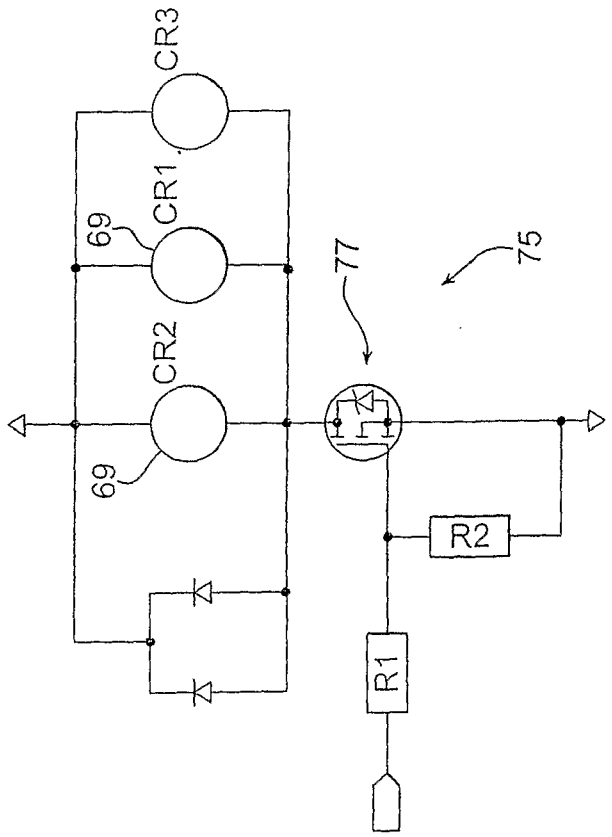
CR3
CR1
69
CR2
69
77
75
R2
R1

FIG. 5

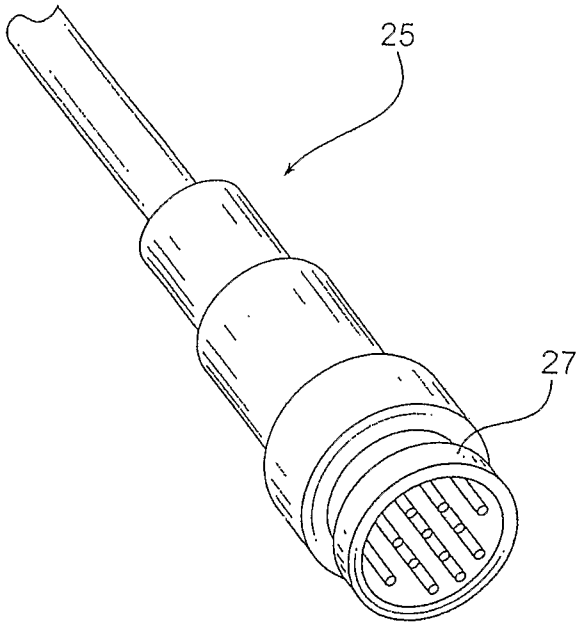

FIG. 7

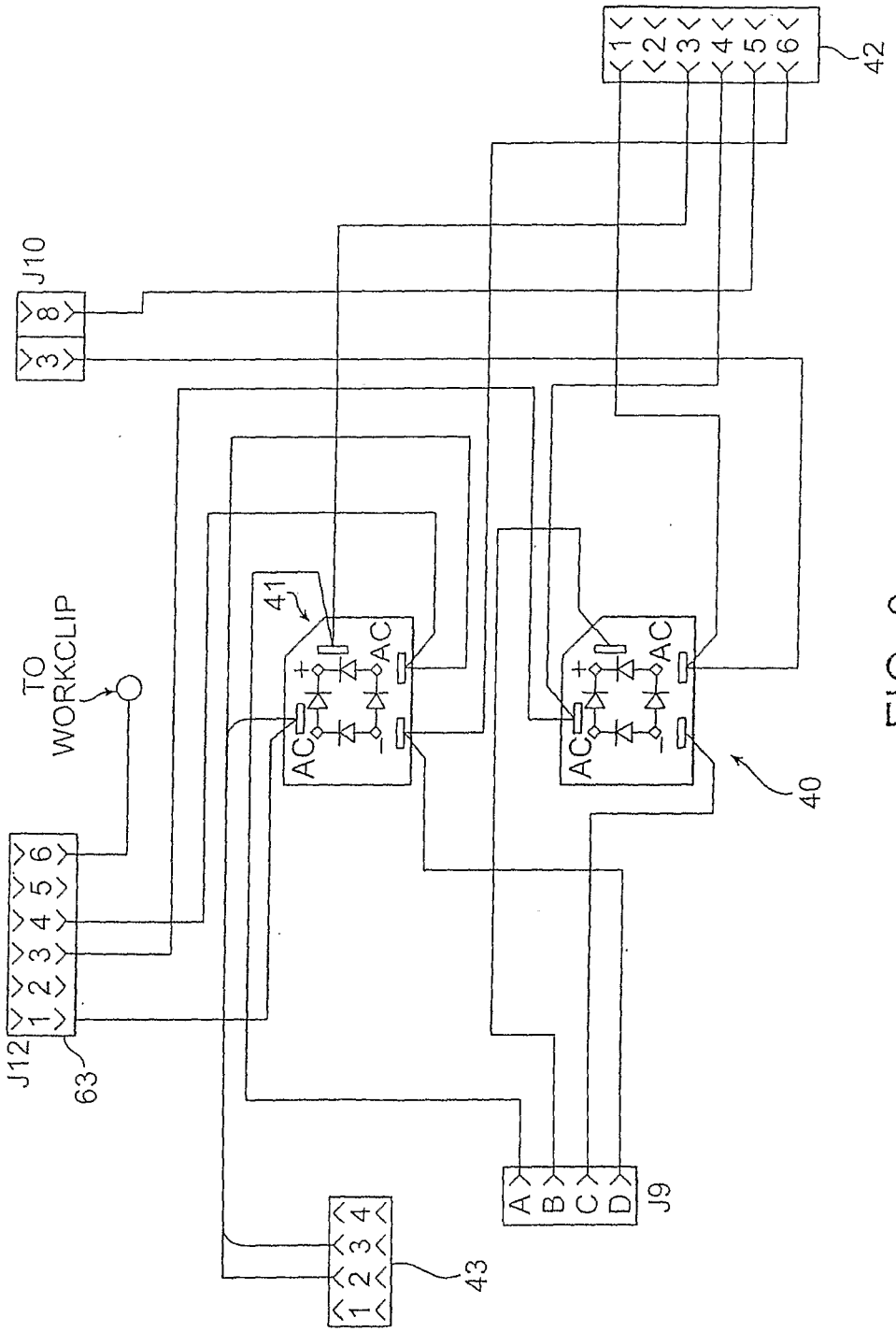
1
2
3
4
5
6
42
J10
8
3
41
AC
AC
AC
AC
TO
WORKCLIP
40
J12
1
2
3
4
5
6
63
A
B
C
D
J9
1
2
3
4
43

FIG. 8

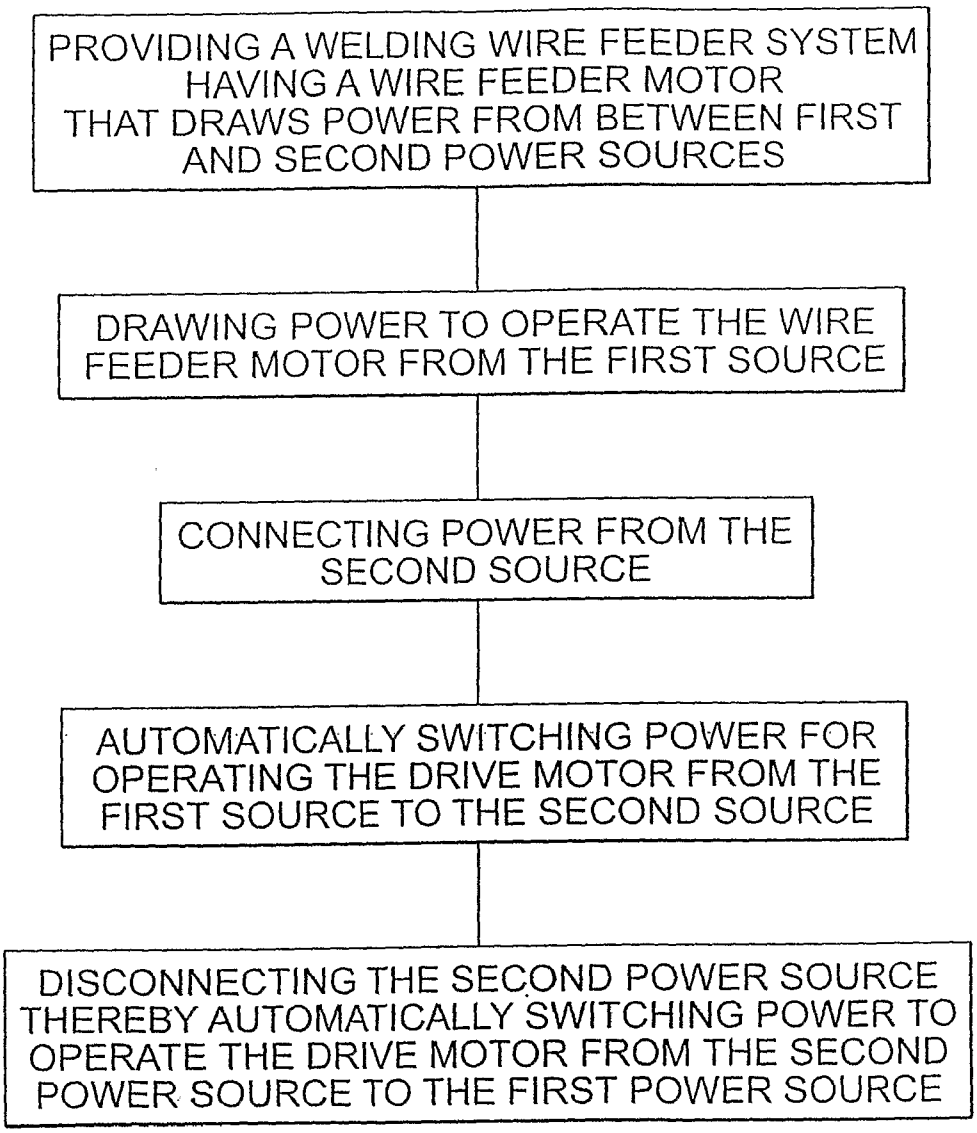
PROVIDING A WELDING WIRE FEEDER SYSTEM HAVING A WIRE FEEDER MOTOR THAT DRAWS POWER FROM BETWEEN FIRST AND SECOND POWER SOURCES
DRAWING POWER TO OPERATE THE WIRE FEEDER MOTOR FROM THE FIRST SOURCE
CONNECTING POWER FROM THE SECOND SOURCE
AUTOMATICALLY SWITCHING POWER FOR OPERATING THE DRIVE MOTOR FROM THE FIRST SOURCE TO THE SECOND SOURCE
DISCONNECTING THE SECOND POWER SOURCE THEREBY AUTOMATICALLY SWITCHING POWER TO OPERATE THE DRIVE MOTOR FROM THE SECOND POWER SOURCE TO THE FIRST POWER SOURCE

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/001324

A. CLASSIFICATION OF SUBJECT MATTER
INV. B23K9/095 B23K9/10 B23K9/12 B23K9/133 G01R31/04
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 G01R

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 practical, 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.
X	JP 61 137675 A (NIPPON STEEL CORP) 25 June 1986 (1986-06-25) * abstract; figures	1-4,11, 12,17,18
Y	DE 41 39 041 A1 (SHIN CATERPILLAR MITSUBISHI LTD.) 4 June 1992 (1992-06-04) * abstract; claims; figures	5,6,13
X Y	US 2005/230372 A1 (B. L. OTT) 20 October 2005 (2005-10-20) paragraphs [0028], [0033] - [0034]; figure 3	1-4,11, 12,17,18 5,6,13
Y	JP 9 262666 A (HITACHI ENG & SERVICES CO LTD) 7 October 1997 (1997-10-07) * abstract; figures	5,6,13

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 September 2010	01/10/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Fax: (+31–70) 340–3016	Jeggy, Thierry

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/001324

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9 128112 A (HITACHI NAKA ELECTRON KK) 16 May 1997 (1997-05-16) * abstract; figures	5,6,13
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Information on patent family members

International application No
PCT/IB2010/001324

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