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(54) PUMP USING MULTI VOLTAGE ELECTRONICS WITH RUN DRY AND OVER CURRENT PROTECTION

PUMPE MIT MEHRSPANNUNGSELEKTRONIK MIT TROCKENLAUF- UND ÜBERSTROMSCHUTZ

POMPE UTILISANT DE L'ÉLECTRONIQUE À MULTIPLES TENSIONS AVEC PROTECTION CONTRE L'ASSÈCHEMENT ET LES SURINTENSITÉS

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EP 2 992 212 B1

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Description

BACKGROUND OF THE INVENTION

1. Field of Invention

[0001] The present invention relates to a pump system and more particularly to a pump system using multi voltage electronics and multiple voltage settings for providing run dry and over current protection to a particular pump model, as well as providing multiple flow rate depending on a selected voltage setting.

2. Description of Related Art

[0002] Most pumps in the markets are usually voltage specific with motors for each voltage. When the pump is running and the fluid is exhausted, there is either a float switch/level switch to shut the pump off that is externally mounted to a container or tank, or the pump simply continues to run until it is damaged or shut off manually.

[0003] Some shortcomings of these known pump designs include the fact that multiple pump models are required for different voltages. Moreover, when the pumps run dry, they are often damaged and require maintenance.

[0004] US 2009/0213515 discloses a multichannel active sensing and switching device (ASSD) 2 having a multiple sensing and switching module 4 and a controller module 6, e.g., as described in paragraph [0057]. In operation a controller module responds to the load type sensor signaling and provides the controller signaling to control the operation of different load types in real time so that events are handled as real time tasks immediately and concurrently.

[0005] US 2004/0265135 discloses a vacuum pumping device having an oil mechanical pump and an electronic control device for supplying an electric motor with power by a voltage signal SU. The electronic control device has a frequency converter that controls an excitation frequency Fecc of the voltage signal SU powering the motor. In transient conditions the excitation frequency Fecc of the power supply signal SU for the motor may be varied so as to keep the speed of the pump constant.

[0006] US 2006/0130504 discloses a vapor compression system having a fluid circuit and 1st and 2nd blower devices. The fluid circuit circulates a refrigerant and has a variable speed compressor and 1st and 2nd heat exchangers.

SUMMARY OF THE INVENTION

[0007] In summary, by utilizing an electronic printed circuit board assembly (PCBA) internal to a pump, one is able to accept 12/24/(possibly 32V+ as well) VDC as well as utilize an external wall mounted power supply to convert 115/230 VAC to run one pump model. The PCBA may also contain software features and controller functionality that protect against run dry and over current situations to protect not only the electronics but the pump as a whole.

[0008] The present invention includes a pump featuring a signal processor, including where the signal processor forms part of a printed circuit board assembly (PCBA), configured to:

receive signaling containing information about a voltage being supplied to a motor to run a particular pump model, and also containing information about whether a current draw of the pump is lower than a predetermined low current level or is higher than a predetermined high current level; and

determine whether to shut off the pump after a predetermined time, based at least partly on the signaling received.

[0009] The signal processor, including the PCBA, is configured to provide control signalling to shut off the pump after the predetermined time if the current draw of the pump is lower than the predetermined low current level or is higher than the predetermined high current level, where the predetermined low current level and the predetermined high current level depend on the voltage being supplied to the motor to run the particular pump model.

[0010] The present invention includes one or more of the following features:

The signal processor, including the PCBA, is configured to provide control signalling to shut off the pump after the predetermined time if the current draw of the pump is lower than the predetermined low current level or is higher than the predetermined high current level, where the predetermined low current level and the predetermined high current level depend on the voltage being supplied to the motor to run the particular pump model.

[0011] The signal processor, including the PCBA, is configured to provide the control signalling to shut the pump off in order to protect the pump against a run dry and/or over current conditions of the pump.

[0012] The control signalling includes l blinking a rocker lamp if the current draw of the pump is either lower than the predetermined low current level or higher than the predetermined high current level.

[0013] The signal processor, including the PCBA, is configured, programmed or adapted to run on the particular pump model having one input voltage, and may also be configured, programmed or adapted to run on a different particular pump model having a different input voltage. For example, the signal processor, including the PCBA, may be configured with a respective software routine for each particular pump model, and implement the appropriate software routine based at least partly on the voltage being supplied to the motor to run the particular pump model. In effect, the PCBA may be configured universally to run on numerous pump models.

[0014] The particular pump model forms part of a se-

ries of pumps having different voltage requirements, including a 12 volt pump, a 24 volt pump, or a 32 volt pump, etc. In the series of pumps, each particular pump model has a respective motor having a corresponding voltage requirement.

[0015] The pump contains the PCBA inside its housing.

The Pump System

[0016] According to some embodiments, the present invention is a pump system featuring a power adapter in combination a pump having a signal processor, including where the signal processor forms part of a printed circuit board assembly (PCBA). The power adapter includes voltage settings, each configured to be set by a user to provide a selected voltage. The signal processor is configured to receive signaling containing information about the selected voltage being supplied to a motor to run the pump, and also containing information about whether a current draw of the pump is lower than a predetermined low current level or is higher than a predetermined high current level; and determine whether to shut off the pump after a predetermined time, based at least partly on the signaling received.

[0017] The pump system includes one or more of the following features:

Each voltage setting corresponds to a respective flow rate of the pump.

[0018] The voltage settings includes at least two voltage settings, e.g., selected from a group that includes a 6 volt setting, a 9 volt setting, a 12 volt setting, an 18 volt setting and a 24 volt setting.

[0019] The PCBA is configured to receive sensed signaling from some combination of a fluid supply sensor, a pressure sensor, a fluid level sensor, and determine whether to shut off the pump after the predetermined time, based at least partly on the sensed signaling received, including when the fluid supply sensor, the pressure sensor or the fluid level sensor is activated.

[0020] The signal processor is configured to implement a start-up process, e.g., including detecting the selected voltage being supplied to the motor.

[0021] The start-up process includes priming the pump at the selected voltage; and either shutting off the pump after the predetermined time if the pump does not prime, or running the pump if the pump does prime.

[0022] The signal processor is configured to implement a normal operating mode process, e.g., including continuing to run the pump if the pump does prime; determining if the pump experiences a low current draw by comparing a sensed current being drawn by the pump to a respective predetermined low current value corresponding to the selected voltage detected; and shutting off the pump after the predetermined time if the sensed current is less than the respective predetermined low current value.

[0023] The normal operating mode process also includes e.g., continuing to run the pump if the pump primes; determining if the pump experiences a high current draw by comparing a sensed current being drawn by the pump to a predetermined high current value; and shutting off the pump after the predetermined time if the sensed current is greater than the predetermined high current value.

[0024] The predetermined high current value includes a respective predetermined high current valve corresponding to the selected voltage detected.

[0025] The predetermined high current value includes a single high current value for any selected voltage detected.

[0026] The fluid supply sensor is configured to sense a fluid supply, and provide a fluid supply signal containing information about the fluid supply, including when the fluid supply is empty.

[0027] The pressure sensor is configured to sense a fluid pressure, and provide a fluid pressure signal containing information about the fluid pressure.

[0028] The fluid level sensor is configured to sense a fluid level, and provide a fluid level signal containing information about the fluid level.

[0029] The pump includes an on/off switch having an integrated light. The integrated light is configured to receive light control signaling and either turn on when the pump is running or blink when the pump shuts off. The signal processor is configured to provide the light control signaling.

[0030] The pump is configured to contain the power adapter so as form an integral pump system. For example, the power adapter is configured in the pump's housing with suitable selectable voltage settings adapted to extend outside and external to the housing for selecting by the user.

[0031] Possible applications may include, e.g., bag-in-box fluid transfer, bottled water dispensers, coffee machine auto-refill, beverage dispensers, general fluid transfer, water pressure systems, or chemical spraying systems.

BRIEF DESCRIPTION OF THE DRAWING

[0032] The drawing includes Figures 1-8, which are not necessarily drawn to scale, as follows:

Figure 1 is a block diagram of pump, according to some embodiments of the present invention.

Figure 2 is a block diagram of components that form part of a pump, according to some embodiments of the present invention.

Figure 3 is a cross sectional view of a pump, according to some embodiments of the present invention.

Figure 4 is a block diagram of a flowchart for providing run dry and over current protection, according to some embodiments of the present invention.

Figure 5 is a diagram of a pump, according to some embodiments of the present invention.

Figure 6 is a block diagram of components that form part of, or cooperate with, a pump, including a motor,

sensor input devices, an on/off switch and a module for receiving input voltage as selectable input power, according to some embodiments of the present invention.

Figure 7 is a block diagram of a flowchart for a control algorithm, e.g., having a start-up process and a normal operating mode, according to some embodiments of the present invention.

Figure 8 is a block diagram of a power adapter having selectable voltage settings, according to some embodiments of the present invention.

DETAILED DESCRIPTION OF BEST MODE OF THE INVENTION

[0033] Figures 1-4 show embodiments that formed part of the aforementioned parent patent application serial no. 13/708,075; and Figures 5-8 show embodiments that formed part of the aforementioned provisional patent application serial no. 61/818,147, and which now form the basis for this CIP patent application.

Figure 1: The Basic Pump 10

[0034] By way of example, Figure 1 shows the present invention in the form of a pump generally indicated as 10 that includes a signal processor, including where the signal processor forms part of a printed circuit board assembly (PCBA) 12, configured to

receive signaling containing information about a voltage being supplied to a motor to run a particular pump model, and also containing information about whether a current draw of the pump is lower than a predetermined low current level or is higher than a predetermined high current level; and

determine whether to shut off the pump after a predetermined time, based at least partly on the signaling received.

[0035] The pump 10 may also include other pump components and parts generally indicated as 14 in Figure 1 that do not form part of the underlying invention, e.g., including a motor 14a, on/off switch 14b, a power supply jack 14c, a pressure switch 14d and a front end pumping portion 14e, as shown in Figures 2 and 3. The power supply jack 14c is configured for receiving or accepting 12/24/(possibly 32V+ as well) VDC as well as utilize an external wall mounted power supply to convert 115/230 VAC to run one pump model. The pressure switches like element 14d are known in the art, may be configured to sense the pressure of fluid being pumped, and provide corresponding signaling, e.g. to turn off the pump if the sensed pressure exceeds some predetermined pumping pressure. Front end pumping portion like element generally indicated as element 14e may be configured for pumping the fluid or liquid of interest by the pump 10 and are known in the art, such that the scope of the invention is not intended to be limited to any particular type, kind or configuration of the same.

[0036] The signal processor, including the PCBA 12, may be configured to provide control signalling to shut off the pump 10 after the predetermined time, e.g., if the current draw of the pump 10 is lower than the predetermined low current level or is higher than the predetermined high current level, where the predetermined low current level and the predetermined high current level depend on the voltage being supplied to the motor 14a (Figure 2) to run the particular pump model. For example, the control signalling may contain information for turning or switching off the motor 14a.

[0037] The signal processor, including the PCBA 12, may be configured to provide the control signalling to shut the pump 10 off in order to protect the pump 10 against a run dry and/or over current conditions of the pump, consistent with the pump control routine generally indicated as 20 shown in Figure 4. For example, see steps 20d, 20h and 20k.

[0038] The control signalling may include blinking a rocker lamp when if the current draw of the pump is either lower than the predetermined low current level or higher than the predetermined high current level, consistent with the pump control routine 20 shown in Figure 4. Again, see the steps 20d, 20h and 20k. The control signalling may include turning a rocker lamp solid when power is removed from the pump 10. See steps 20g and 20i.

[0039] The signal processor, including the PCBA 12, may be configured and programmed to run on the particular pump model having one input voltage, and may also be configured, programmed and/or suitably to run on a different particular pump model having a different input voltage for running a pump motor.

[0040] The signal processor, including the PCBA 12, may be configured with at least one processor and at least one memory including computer program code, the at least one memory and computer program code configured, with the at least one processor, to cause the signal processor to receive the signaling containing information about the voltage being supplied to the motor to run the particular pump model, and also containing information about whether the current draw of the pump is lower than the predetermined low current level or is higher than the predetermined high current level; and determine whether to shut off the pump after the predetermined time, based at least partly on the signaling received.

[0041] The present invention may also take the form of a method including steps for receive signaling containing information about a voltage being supplied to a motor such as 14a (Figure 2) to run a particular pump model, and also containing information about whether a current draw of the pump 10 is lower than a predetermined low current level or is higher than a predetermined high current level; and determining whether to shut off the pump after a predetermined time, based at least partly on the signaling received.

[0042] By way of example, the direct current voltage may be in a range of about 12-32 volts; and the alternating current voltage may be in a corresponding range of about 115/230 volts, although the scope of the invention is not intended to be limited to any particular voltage or voltage range.

Signal Processor 12

[0043] By way of example, and consistent with that described herein, the functionality of the signal processor, device or module and/or PCBA 12 may be implemented to receive the signaling, process the signaling therein and/or provide the control signaling, using hardware, software, firmware, or a combination thereof, although the scope of the invention is not intended to be limited to any particular embodiment thereof. In a typical software implementation, the signal processor, including the PCBA 12, may include, or take the form of, one or more microprocessor-based architectures having a microprocessor, a random access memory (RAM), a read only memory (ROM), input/output devices and control, data and address busing architecture connecting the same. A person skilled in the art would be able to program such a microprocessor-based implementation to perform the functionality set forth herein, as well as other functionality described herein without undue experimentation. The scope of the invention is not intended to be limited to any particular implementation using technology either now known or later developed in the future. Moreover, the scope of the invention is intended to include a signal processor as either part of the aforementioned apparatus, as a stand alone module, or in the combination with other circuitry for implementing another module.

[0044] Techniques for receiving signaling in such a signal processor, device, module or PCBA like element 12 are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Based on this understanding, a person skilled in the art would appreciate, understand and be able to implement and/or adapt the signal processor, device, module or PCBA like element 12 without undue experimentation so as to receive the signaling containing information about a voltage being supplied to a motor to run a particular pump model, and also containing information about whether a current draw of the pump is lower than a predetermined low current level or is higher than a predetermined high current level, consistent with that set forth herein.

[0045] Techniques for determining signaling from other signaling are also known in the art, , and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Based on this understanding, a person skilled in the art would appreciate, understand and be able to implement and/or adapt the signal processor, device, module or PCBA like element 12 without undue experimentation so as to determine whether to shut off the pump after a predetermined time, based at least partly on the signaling received.

[0046] Techniques for providing signaling a signal processor such as element 12 are also known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Based on this understanding, a person skilled in the art would appreciate, understand and be able to implement and/or adapt the signal processor, device, module or PCBA like 12 without undue experimentation so as to provide control signalling to shut off the pump after the predetermined time if the current draw of the pump is lower than the predetermined low current level or is higher than the predetermined high current level, where the predetermined low current level and the predetermined high current level depend on the voltage being supplied to the motor to run the particular pump model, consistent with that set forth herein.

[0047] It is also understood that the apparatus 10 may include one or more other modules, components, processing circuits, or circuitry 14 for implementing other functionality associated with the underlying apparatus that does not form part of the underlying invention, and thus is not described in detail herein. By way of example, the one or more other modules, components, processing circuits, or circuitry may include random access memory, read only memory, input/output circuitry and data and address buses for use in relation to implementing the signal processing functionality of the signal processor, or devices or components, etc.

Figure 4 The Method

[0048] Figure 4 shows a flowchart generally indicated as 20 having steps 20a, 20b, 20c, ..., 20j and 20k for operating the pump 10, including for providing run dry and over current protection controller functionality, according to some embodiments of the present invention. In addition to the controller functionality set forth in Figure 4, the signal processor, including the PCBA 12, may be configured to execute a time out in order to turn the pump off, e.g., including in order to prevent the pump from emptying a container or reservoir of liquid if there should be any leaks in the system as a whole. By way of example, the executed time out feature may take the form of a predetermined time out, e.g., which may be set at 5 minutes and can be set for anytime, that is a safety feature to prevent the pump from emptying the container or reservoir of a fluid. The executed time out feature may also be used as a safety shutoff in general. Based on the flowchart in Figure 4 and steps 20a, 20b, 20c, ..., 20j and 20k set forth therein, a person skilled in the art would understand, appreciate and be able to program the signal processor, including the PCBA 12, with a computer program to implement the control functionality to run the particular pump model according to the present invention.

Applications

[0049] The present invention may also be used in, or form part of, or used in conjunction with, any fluid handling application. The scope of the invention is also not intended to be limited to being implemented in any particular type or kind of pump either now known or later developed in the future, and may include diaphragm pumps, positive displacement pumps, etc.

Pump with Multiple Voltage Inputs for Various Flow/Pressure Rates, Multiple Feedback Devices, Run-dry & Time Out Capability

Description of Other Prior Art Devices:

[0050] Typical diaphragm pumps known in the art are designed with single voltage/power input and deliver a specific flow/pressure rate, have no feedback input or limited to one type (typically a mechanical pressure switch or similar). Some disadvantages of these prior art pumps include the following: Limited applications, flow rates and pressures are not adjustable, and they are not capable of different device/sensor input. Multiple motor/pump combinations are needed to achieve different flows and pressures.

Summary of Additional Features

[0051] According to some embodiments of the present invention, the pump can have the capability to accept various voltage inputs (6/9/12/18/24 vdc) through a power adaptor. This will allow users to select different flow rates for their applications. Different types of sensors can be integrated with the pump to monitor fluid supply, pressure, fluid level, etc. Reverse polarity, over-current, run-dry and time-out protections may also be integrated in the printed circuit board assembly (PCBA) and control algorithm software.

Figures 5-8: Detailed Description of Additional Features

[0052] The following sets forth additional features that may be used in conjunction with that disclosed in the aforementioned parent application, e.g., including that shown and described in relation to Figures 1-4 herein.

The Pump System

[0053] Figures 5-8 show a pump system featuring a power adapter 250 (Figure 8) in combination a pump 100 (Figure 5) having a signal processor, e.g., which may take the form of element 12 in Figure 1, and/or which may form part of a printed circuit board assembly (PCBA) 120 (Figure 6).

[0054] The pump 100 may include a motor housing 110, the PCBA 120, a motor 140a, a light/rocker switch 140b, a DC jack 140c, mounting legs $140d_1$, $140d_2$ and a pump head 140e. By way of example, as shown the pump 100 may be configured as a diaphragm pump, and the pump head 140e may include standard diaphragm components, including a diaphragm, a wobbler plate, reciprocating pistons, check valves, etc., all of which would be appreciated by one skilled in the art. The pump head 140e is not described in detail since it does not form part of the point of novelty of the underlying invention. Moreover, the scope of the invention is not intended to be limited to implementations related only to diaphragm pumps, e.g., embodiments are envisioned implementing the present invention using other types or kinds of pumps either now known or later developed in the future, e.g., including positive displacement pumps, etc.

[0055] Consistent with that shown in Figure 8, the power adapter 250 may include selectable voltage settings 256a, 256b, 256c, 256d, 256e, each configured to be set by a user so as to provide a selected voltage, e.g., to the motor 140a of the punmp 100. By way of example, the selectable voltage settings 256a, 256b, 256c, 256d, 256e may be a push button switch type, a slide/toggle switch type, etc. The power adapter 250 may also include a wall plug 252 having prongs, as shown in Figure 8, e.g., for plugging into a standard wall socket (not shown), and a housing 253 for containing the electronics associated with the selectable voltage settings 256a, 256b, 256c, 256d, 256e. The power adapter 250 may also include a cord 254a and a coupler 254b for plugging into the DC jack 140c (Figure 5) of the pump 100. A person skilled in the art would be able to configured or implement such a power adapter without undue experimentation consistent with that disclosed herein, as well as that known in the prior art. Moreover, the scope of the invention is not intended to be limited to any particular type or kind of power adapter either now know or later developed in the future.

[0056] Embodiments are also envisioned in which the pump 100 may be configured to contain in its housing a power adapter so as form an integrated pump system. For example, a power adapter like element 250 may be configured in the pump's housing, e.g., in the motor housing 110 (Figure 5), with suitable selectable voltage settings like voltage settings 256a, 256b, 256c, 256d, 256e adapted to extend outside and external to the pump's housing for selecting by a user. In such an integrated pump system, e.g., the housing 253 (Figure 8) and the pump's housing, e.g., the motor housing 110 (Figure 5), may be configured as one integral unit.

[0057] In operation, the signal processor may be configured to receive signaling containing information about the selected voltage, e.g., received from the power adapter 250 (Figure 8), being supplied to the motor 140a to run the pump 100, and also containing information about whether a current draw of the pump 100 is lower than a predetermined low current level or is higher than a predetermined high current level; and determine whether to shut off the pump 100, e.g., after a predetermined time, based at least partly on the signaling received.

Selectable Voltage Settings

[0058] By way of example, the voltage settings 256a, 256b, 256c, 256d, 256e may include at least two voltage settings, e.g., selected from a group that includes a 6 volt setting, a 9 volt setting, a 12 volt setting, an 18 volt setting and a 24 volt setting. The scope of the invention is not intended to be limited to any particular voltage setting(s); and embodiments are envisioned using other types of voltage settings either now known or later developed in the future, e.g., including a 32 volt setting, depending on the particular application of the present invention.

[0059] Each voltage setting 256a, 256b, 256c, 256d, 256e may correspond to a respective flow rate of the pump. For example, the 6 volt setting may correspond to a first flow rate; the 9 volt setting may correspond to a second flow rate, e.g., that is higher than the first flow rate; the 12 volt setting may correspond to a third flow rate, e.g., that is higher than the second flow rate; the 18 volt setting may correspond to a fourth flow rate, e.g., that is higher than the third flow rate; and the 24 volt setting may correspond to a fifth flow rate, e.g., that is higher than the fourth flow rate. The scope of the invention is not intended to be limited to any particular flow rate(s); and embodiments are envisioned using other types of flow rate(s) either now known or later developed in the future, e.g., depending on the particular application of the present invention.

[0060] By way of example, voltage signaling received by the DC jack 140c (Figure 5) of the pump 100 from the coupler 154b of the power adapter 250 may be received and processed by the module 134 for receiving the input voltage as selectable input power shown in Figure 6, and the voltage signaling may be provided from the module 134 to the PCBA 120 via leads 134a, 134b.

Sensors 130

[0061] Consistent with that shown in Figure 6, and by way of example, the PCBA 120 may be configured to receive sensed signaling from one or more sensors 130, e.g., including some combination of a fluid supply sensor, a pressure sensor, a fluid level sensor, and determine whether to shut off the pump 100 after the predetermined time, based at least partly on the sensed signaling received, including when the fluid supply sensor, the pressure sensor or the fluid level sensor is activated. In particular, the fluid supply sensor may be configured to sense a fluid supply, and provide a fluid supply signal containing information about the fluid supply, including when the fluid supply is empty or exhausted. The pressure sensor may be configured to sense a fluid pressure, and provide a fluid pressure signal containing information about the fluid pressure. The fluid level sensor may be configured to sense a fluid level, and provide a fluid level signal containing information about the fluid level. The PCBA 120 may be coupled to the one or more sensors using leads 130a, 130b, and the sensed signaling may be received along the leads 130a, 130b. The scope of the invention is not intended to be limited to any particular sensor(s); and embodiments are envisioned using other types of sensor(s) either now known or later developed in the future, e.g., depending on the particular application of the present invention. Moreover, fluid supply sensors, pressure sensors, and fluid level sensors are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future.

On/off Switch 132

[0062] Consistent with that shown in Figure 6, and by way of example, the pump 100 may include an on/off switch 132, e.g., having an integrated light. The integrated light may be configured to receive light control signaling and either turn on when the pump 100 is running or blink when the pump 100 shuts off. The signal processor may be configured to provide the light control signaling, e.g., via leads 132a, 132b, coupling the on/off switch 132 and the PCBA 120 together. The scope of the invention is not intended to be limited to any particular on/off switch; and embodiments are envisioned using other types or kinds of on/off switch either now known or later developed in the future, e.g., depending on the particular application of the present invention, including a light switch having LED lighting. Moreover, on/off switches, e.g., having an integrated light, are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future.

Start-up Process and Normal Operating Mode

[0063] Consistent with that shown in Figure 7, the signal processor may be configured to implement a control algorithm 200, e.g., that may include a start-up process 202 and/or a normal operating mode 204.

The Start-up Process 202

[0064] By way of example, the signal processor may be configured to implement the start-up process 202, e.g., including using one or more steps 202a, 202b, 202c and 202d.

[0065] In step 202a, power may be applied to the pump 100 by the power adapter 250 (Figure 8), e.g., in the form of an voltage setting output corresponding to the selectable voltage setting 256a, 256b, 256c, 256d, 256e and provided from the coupler 254b of the power adapter 250 to the DC jack 140c of the pump 100. By way of example, step 202a may include the user plugging in the power adapter 250 into a wall socket (not shown), plugging the coupler 254b of the power adapter 250 into the DC jack 140c of the pump 100, and selecting one of the selectable voltage setting 256a, 256b, 256c, 256d, 256e to determine what voltage setting output will be provided by the

power adapter 250 to the motor 140a of the pump 100.

[0066] In step 202b, the signal processor may be configured to implement the control algorithm software for detecting the selected voltage being supplied to the motor 140a. If the signal processor does not detect the selected voltage being supplied to the motor 140a, then step 202a may need to be re-implemented, e.g., by the user. Algorithms for detecting a voltage being supplied to a motor are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for detecting such a voltage being supplied to such a motor like motor 140a without undue experimentation based on that disclosed in the instant patent application.

[0067] In step 202c, the signal processor may be configured to implement the control algorithm software for priming the pump 100 at the selected voltage. The control algorithm software may be configured to prime the pump 100 based on the selected voltage, e.g., using a different control algorithm for each different selected voltage. Alternatively, the control algorithm software may be configured to prime the pump 100, e.g., using one standard implementation for priming for each different selected voltage. Algorithms for priming pumps are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for priming such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0068] In step 202d, the signal processor may be configured to implement the control algorithm software for either shutting off the pump 100 after the predetermined time if the pump 100 does not prime, or running the pump 100 if the pump 100 does prime. Algorithms for shutting off pumps after a predetermined time if a pump does not prime, or running the pump if the pump does prime, are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for shutting off or running such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

The Normal Operating Mode Process 204

[0069] The signal processor may be configured to implement the normal operating mode process, e.g., including using one or more steps 204a, 204b, 204c, 204d, 204e, 204f and 204g.

[0070] In step 204a, the signal processor may be configured to implement the control algorithm software for continuing to run the pump 100 if the pump 100 primes. Algorithms for running pumps if the pumps prime are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for running such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0071] In step 204b, the signal processor may be configured to implement the control algorithm software for determining if the pump 100 experiences a low current draw by comparing a sensed current being drawn by the pump 100 to a respective predetermined low current value corresponding to the selected voltage detected. By way of example, if the selected voltage is in the range of 10-12 volts, then the respective predetermined low current value may be about 0.3 amps; if the selected voltage is in the range of 16-18 volts, then the respective predetermined low current value may be about 0.5 amps; and if the selected voltage is in the range of 22-24 volts, then the respective predetermined low current value may be about 0.7 amps. Algorithms for determining if pumps experience a low current draw by comparing sensed current drawn to some predetermined current value are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for making such a determination for such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0072] If the determination in step 204a is yes, then the signal processor may be configured to implement the control algorithm software associated with step 202d, e.g., for shutting off the pump 100 after the predetermined time if the sensed current is less than the respective predetermined low current value, including blinking the light on the on/off switch 132, consistent with that set forth above. By way of example, if the selected voltage is in the range of 10-12 volts, and the sensed current being drawn by the pump 100 is less than about 0.3 amps, then the signal processor may be configured to shut the pump 100 off and blink the light on the on/off switch 132, e.g., by sending suitable control signaling to the pump 100 and the on/off switch 132. Alternatively, if the selected voltage is in the range of 16-18 volts, and the sensed current being drawn by the pump 100 is less than about 0.5 amps, then the signal processor may be configured to shut the pump 100 off and blink the light on the on/off switch 132. Alternatively, if the selected voltage is in the range of 22-24 volts, and the sensed current being drawn by the pump 100 is less than about 0.7 amps, then the signal processor may be configured to shut the pump 100 off and blink the light on the on/off switch 132. If the determination in step 204b is no, then the signal processor may be configured to implement the control algorithm software to continue to run the pump 100, consistent with step 204a. Algorithms for shutting off pumps and/or blinking lights are known in the art, and the scope of the in-

vention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement any such an algorithm for operating such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0073] In step 204c, the signal processor may be configured to implement the control algorithm software for determining if the pump 100 experiences a high current draw by comparing a sensed current being drawn by the pump 100 to a predetermined high current value, e.g. including a respective predetermined high current value corresponding to the selected voltage detected. The functionality may form part of so-called over current protection and functionality. Embodiments are envisioned in which the predetermined high current value depends on the selected voltage, as well as in which one predetermined high current value is used for any selected voltage. If the determination in step 204c is no, then the signal processor may be configured to implement the control algorithm software to continue to run the pump 100, consistent with that set forth in relation to step 204a. Algorithms for determining if pumps experience a high current draw by comparing sensed current drawn to some predetermined current value are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for making such a determination for such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0074] If the determination in step 204c is yes, then in step 204d the signal processor may be configured to implement the control algorithm software for shutting off the pump, e.g., after the predetermined time, if the sensed current is greater than the respective predetermined high current value, e.g., consistent with that set forth in relation to step 202d.

[0075] In step 204e, the signal processor may be configured to implement the control algorithm software to determine if one or more of the sensors 130, e.g., including some combination of a fluid supply sensor, a pressure sensor, a fluid level sensor, is activated. If the determination in step 204e is yes, then in step 204f the signal processor may be configured to implement the control algorithm software for shutting off the pump, e.g., after the predetermined time, consistent with that set forth in relation to step 202d. The functionality may form part of so-called run-dry functionality, e.g., when the liquid being pumped has been exhausted. Moreover, the signal processor may be configured to implement the control algorithm software to put the pump 100 in a standby mode, e.g., until pressure is released from the pump 100. If the determination in step 204e is no, then the signal processor may be configured to implement the control algorithm software to continue to run the pump 100, consistent with that set forth in relation to step 204a. Algorithms for determining if sensors are activated, e.g., including some combination of a fluid supply sensor, a pressure sensor, a fluid level sensor, are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for making such a determination for such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0076] In step 204g, the signal processor may be configured to implement the control algorithm software to determine if the pump 100 runs for more than a predetermined time, e.g., including a number of predetermined minutes. The functionality may form part of so-called time-out capability and functionality. If the determination in step 204g is yes, then in step 204d the signal processor may be configured to implement the control algorithm software for shutting off the pump 100, e.g., after the predetermined time, consistent with that set forth in relation to step 202d. If the determination in step 204g is no, then the signal processor may be configured to implement the control algorithm software to continue to run the pump 100, consistent with that set forth in relation to step 204a. Algorithms for determining how long a pump is running are known in the art, and the scope of the invention is not intended to be limited to any particular type or kind thereof either now known or later developed in the future. Moreover, one skilled in the art would be able to implement such an algorithm for making such a determination for such a pump like pump 100 without undue experimentation based on that disclosed in the instant patent application.

[0077] Possible applications may include, e.g., bag-in-box fluid transfer, bottled water dispensers, coffee machine auto-refill, beverage dispensers, general fluid transfer, water pressure systems, or chemical spraying systems.

Claims

1. A pump system (100) comprising:

a pump (10) configured to accept various input voltages corresponding to a voltage setting selected by a user and to operate the pump (10) at a different flow rate for a particular application based upon the selected voltage being supplied to a motor (14a, 140a) to run the pump (10), the pump (10) having a signal processor (12),
the signal processor (12) is configured to: receive signaling

containing information about the selected voltage, and also
containing information about whether a current draw of the pump (10) is lower than a

predetermined low current level corresponding to the selected voltage or is higher than a predetermined high current level corresponding to the selected voltage,

the predetermined low current level being lower than the predetermined high current level to determine a range corresponding to the voltage setting selected; and
determine corresponding signaling containing information about whether to shut off the pump (10) after a predetermined time if the sensed current is less than the respective predetermined low current value for providing run dry and over current protection controller functionality, based at least partly on the signaling received, **characterized by**
a power adapter (250) having voltage settings, each voltage setting configured to be set by a user to provide the selected voltage corresponding to the different flow rate selected by the user for a particular application, the power adapter (250) configured to respond to the voltage setting selected by the user and provide the selected voltage corresponding to the voltage setting, and
the signal processor (12) forming part of a printed circuit board assembly (120), referred to hereinafter as PCBA.

2. A pump system (100) according to claim 1, wherein each voltage setting corresponds to a respective flow rate of the pump (10).

3. A pump system (100) according to claim 1, wherein the voltage settings include at least two voltage settings selected from a group that includes a 6 volt setting, a 9 volt setting, a 12 volt setting, an 18 volt setting and a 24 volt setting.

4. A pump system (100) according to claim 1, wherein the PCBA (120) is configured to receive sensed signaling from a fluid supply sensor, or a pressure sensor, or a fluid level sensor, and determine whether to shut off the pump (10) after the predetermined time, based at least partly on the sensed signaling received, including when the fluid supply sensor, the pressure sensor or the fluid level sensor is activated.

5. A pump system (100) according to claim 1,
wherein the signal processor (12) is configured to implement a start-up process comprising:

detecting the selected voltage being supplied from the power adapter (250) to the motor (14a); and either
wherein the start-up process comprises:

priming the pump (10) at the selected voltage, and
either shutting off the pump (10) after the predetermined time if the pump (10) does not prime,
or running the pump (10) if the pump (10) does prime,
or the signal processor (12) is configured to implement a normal operating mode process comprising:

determining if the pump (10) experiences a first current draw by comparing a sensed current being drawn by the pump (10) to a respective predetermined low current value corresponding to the selected voltage detected, and
shutting off the pump (10) after the predetermined time if the sensed current is less than the respective first predetermined current value; or
the normal operating mode process includes:

determining if the pump (10) experiences a second current draw by comparing a sensed current being drawn by the pump (10) to a predetermined high current value, and
shutting off the pump (10) after the predetermined time if the sensed current is greater than the predetermined high current value.

6. A pump system (100) according to claim 1, wherein the signal processor (12) is configured to implement a normal operating mode process comprising:

determining if the pump (10) experiences a first current draw by comparing a sensed current being drawn by the pump (10) to a respective predetermined low current value corresponding to the selected voltage, and
shutting off the pump (10) after the predetermined time if the sensed current is less than the respective first predetermined low current value; or
the normal operating mode process includes:

determining if the pump (10) experiences a second current draw by comparing the sensed current being drawn by the pump (10) to a predetermined high current value; and
shutting off the pump (10) after the predetermined time if the sensed current is greater than the respective predetermined high current value.

7. A pump system (100) according to claim 5, wherein either the predetermined second current value is a respective predetermined high current value corresponding to the selected voltage detected, or the predetermined high current value is a single second current value for any selected voltage detected.

8. A pump system (100) according to claim 5, wherein the normal operating mode process includes:

determining if the pump (10) experiences a second current draw by comparing the sensed current being drawn by the pump (10) to a predetermined high current value; and
shutting off the pump (10) after the predetermined time if the sensed current is greater than the predetermined high current value.

9. A pump system (100) according to claim 1, wherein the normal operating mode process includes:

determining if the pump (10) experiences a second current draw by comparing a sensed current being drawn by the pump (10) to a predetermined high current value; and
shutting off the pump (10) after the predetermined time if the sensed current is greater than the respective predetermined high current value.

10. A pump system (100) according to claim 4, wherein the pressure sensor is configured to sense a fluid pressure, and provide a fluid pressure signal containing information about the fluid pressure.

11. A pump system (100) according to claim 4, wherein the fluid level sensor is configured to sense a fluid level, and provide a fluid level signal containing information about the fluid level.

12. A pump system (100) according to claim 1, wherein the pump comprises an on/off switch having an integrated light.

13. A pump system (100) according to claim 12, wherein the integrated light is configured to receive light control signaling and either turn on when the pump (10) is running or blink when the pump (10) shuts off, and the signal processor (12) is configured to provide the light control signaling.

14. A pump system (100) according to claim 1, wherein the pump system (100) is configured as an integral pump system so that the pump (10) contains the power adapter (250); and the pump (10) comprises a housing, including a motor housing (110); and the voltage settings are adapted to extend outside and external to the housing of the pump (10) to be selected by the user.

Patentansprüche

1. Ein Pumpen-System (100) bestehend aus:

einer Pumpe (10), die so konfiguriert ist, dass sie verschiedene Eingangsspannungen akzeptiert, die einer von einem Benutzer gewählten Spannungseinstellung entsprechen, und
dass sie die Pumpe (10) mit einer unterschiedlichen Durchflussrate für eine bestimmte Anwendung auf Grundlage der gewählten Spannung betreibt, die einem Motor (14a, 140a) zugeführt wird, um die Pumpe (10) zu betreiben,
wobei die Pumpe (10) einen Signalprozessor (12) aufweist,
der Signalprozessor (12) ist konfiguriert:

Signale zu empfangen,

die Informationen über die gewählte Spannung enthalten, und auch
Informationen darüber enthalten, ob eine Stromaufnahme der Pumpe (10) niedriger als ein vorbestimmter niedriger Stromwert entsprechend der gewählten Spannung oder höher als ein vorbestimmter hoher Stromwert entsprechend der gewählten Spannung ist,

wobei der vorbestimmte niedrige Stromwert niedriger als der vorbestimmte hohe Stromwert ist, um einen Bereich zu bestimmen, der der gewählten Spannungseinstellung entspricht; und
entsprechende Signale zu bestimmen, die Informationen darüber enthalten, ob die Pumpe (10) nach einer vorbestimmten Zeit abgeschaltet werden soll, wenn der gemessene Strom geringer als der jeweilige vorbestimmte niedrige Stromwert ist, um eine Trockenlauf- und Überstromschutzfunktionalität bereitzustellen, die zumindest teilweise auf den empfangenen Signalen basieren, **gekennzeichnet durch**
ein Netzteil (250) mit Spannungseinstellungen, wobei jede Spannungseinstellung so konfiguriert ist, dass sie von einem Benutzer eingestellt werden kann, um die gewählte Spannung entsprechend der vom Benutzer für eine bestimmte Anwendung gewählten unterschiedlichen Durchflussrate bereitzustellen,
wobei das Netzteil (250) so konfiguriert ist, dass es auf die vom Benutzer gewählte

Spannungseinstellung reagiert und die gewählte Spannung entsprechend der Spannungseinstellung bereitstellt, und
der Signalprozessor (12) Teil einer Leiterplattenbaugruppe (120) ist, im Folgenden als PCBA bezeichnet.

2. Ein Pumpen-System (100) nach Anspruch 1, wobei jede Spannungseinstellung einer jeweiligen Durchflussrate der Pumpe (10) entspricht.

3. Ein Pumpen-System (100) nach Anspruch 1, wobei die Spannungseinstellungen mindestens zwei Spannungseinstellungen umfassen, die aus einer Gruppe ausgewählt sind, die eine 6-Volt-Einstellung, eine 9-Volt-Einstellung, eine 12-Volt-Einstellung, eine 18-Volt-Einstellung und eine 24-Volt-Einstellung umfasst.

4. Ein Pumpen-System (100) nach Anspruch 1, wobei der PCBA (120) so konfiguriert ist, dass er von einem Fluidversorgungssensor oder einem Drucksensor oder einem Fluidwertsensor erfasste Signale empfängt und bestimmt, ob die Pumpe (10) nach der vorbestimmten Zeit abgeschaltet werden soll, basierend zumindest teilweise auf den empfangenen erfassten Signalen, einschließend, dass der Fluidversorgungssensor, der Drucksensor oder der Fluidwertsensor aktiviert ist.

5. Ein Pumpen-System (100) nach Anspruch 1, wobei der Signalprozessor (12) konfiguriert ist, um einen Startprozess zu implementieren, der umfasst:

Erfassen der ausgewählten Spannung, die von dem Netzteil (250) an den Motor (14a) geliefert wird; und entweder umfasst der Startprozess:

Ansaugen der Pumpe (10) bei der gewählten Spannung, und entweder Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn die Pumpe (10) nicht ansaugt, oder Betreiben der Pumpe (10), wenn die Pumpe (10) ansaugt, oder) der Signalprozessor (12) ist so konfiguriert, dass er einen normalen Betriebsmodus-Prozess implementiert, der umfasst:

Bestimmen, ob die Pumpe (10) eine erste Stromaufnahme erfährt, indem ein erfasster Strom, der von der Pumpe (10) gezogen wird, mit einem jeweiligen vorbestimmten niedrigen Stromwert verglichen wird, der der erfassten ausgewählten Spannung entspricht, und
Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der gemessene Strom kleiner als der jeweilige erste vorbestimmte Stromwert ist; oder
der normale Betriebsmodusprozess umfasst:

Bestimmen, ob die Pumpe (10) eine zweite Stromaufnahme erfährt, indem ein erfasster Strom, der von der Pumpe (10) gezogen wird, mit einem vorbestimmten hohen Stromwert verglichen wird, und
Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der gemessene Strom größer als der vorbestimmte hohe Stromwert ist.

6. Ein Pumpen-System (100) nach Anspruch 1, wobei der Signalprozessor (12) konfiguriert ist, um einen normalen Betriebsmodusprozess zu implementieren, umfassend:

Bestimmen, ob die Pumpe (10) eine erste Stromaufnahme erfährt, indem ein erfasster Strom, der von der Pumpe (10) gezogen wird, mit einem jeweiligen vorbestimmten niedrigen Stromwert, der der ausgewählten Spannung entspricht, verglichen wird, und
Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der gemessene Strom kleiner als der jeweilige erste vorbestimmte niedrige Stromwert ist; oder
der normale Betriebsmodusprozess umfasst:

Bestimmen, ob die Pumpe (10) eine zweite Stromaufnahme erfährt, indem der erfasste Strom, der von der Pumpe (10) gezogen wird, mit einem vorbestimmten hohen Stromwert verglichen wird; und
Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der erfasste Strom größer als der jeweilige vorbestimmte hohe Stromwert ist.

7. Pumpen-System (100) nach Anspruch 5, wobei entweder der vorbestimmte zweite Stromwert ein jeweiliger vorbestimmter hoher Stromwert ist, der der erfassten ausgewählten Spannung entspricht, oder der vorbestimmte hohe Stromwert ein einzelner zweiter Stromwert für jede erfasste ausgewählte Spannung ist.

8. Pumpen-System (100) nach Anspruch 5, wobei der normale Betriebsmodusprozess umfasst:

Bestimmen, ob die Pumpe (10) eine zweite Stromaufnahme erfährt, indem der erfasste Strom, der von der Pumpe (10) gezogen wird, mit einem vorbestimmten hohen Stromwert verglichen wird; und

Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der gemessene Strom größer als der vorbestimmte hohe Stromwert ist.

9. Pumpen-System (100) nach Anspruch 1, wobei der normale Betriebsmodusprozess umfasst:

Bestimmen, ob die Pumpe (10) eine zweite Stromentnahme erfährt, durch Vergleichen eines gemessenen Stroms, der von der Pumpe (10) gezogen wird, mit einem vorbestimmten hohen Stromwert; und
Abschalten der Pumpe (10) nach der vorbestimmten Zeit, wenn der gemessene Strom größer als der jeweilige vor bestimmte hohe Stromwert ist.

10. Pumpen-System (100) nach Anspruch 4, wobei der Drucksensor so konfiguriert ist, dass er einen Fluiddruck erfasst und ein Fluiddrucksignal bereitstellt, das Informationen über den Fluiddruck enthält.

11. Pumpen-System (100) nach Anspruch 4, wobei der Fluidwertsensor so konfiguriert ist, dass er einen Fluidwert erfasst und ein Fluidwertsignal bereitstellt, das Informationen über den Fluidwert enthält.

12. Pumpen-System (100) nach Anspruch 1, wobei die Pumpe einen Ein/Aus-Schalter mit einer integrierten Leuchte aufweist.

13. Pumpen-System (100) nach Anspruch 12, wobei das integrierte Licht so konfiguriert ist, dass es Lichtsteuersignale empfängt und sich entweder einschaltet, wenn die Pumpe (10) läuft, oder blinkt, wenn die Pumpe (10) abschaltet, und der Signalprozessor (12) so konfiguriert ist, dass er die Lichtsteuersignale bereitstellt.

14. Pumpen-System (100) nach Anspruch 1, wobei das Pumpen-System (100) als integrales Pumpsystem konfiguriert ist, so dass die Pumpe (10) das Netzteil (250) enthält; und die Pumpe (10) ein Gehäuse einschließlich eines Motorgehäuses (110) umfasst; und die Spannungseinstellungen so angepasst sind, dass sie aus dem Gehäuse ragen und sich außerhalb des Gehäuses der Pumpe (10) erstrecken, um vom Benutzer ausgewählt zu werden.

Revendications

1. Système de pompe (100) comprenant:

une pompe (10) configurée pour accepter diverses tensions d'entrée correspondant à un réglage de tension sélectionné par un utilisateur et pour actionner la pompe (10) à un débit différent pour une application particulière sur la base de la tension sélectionnée qui est fournie à un moteur (14a, 140a) pour faire fonctionner la pompe (10), la pompe (10) ayant un processeur de signal (12),
le processeur de signal (12) est configuré pour:

recevoir une signalisation

contenant des informations indiquant la tension sélectionnée, et également
contenant des informations indiquant si un tirage de courant de la pompe (10) est inférieur à un niveau de courant bas prédéterminé correspondant à la tension sélectionnée ou est supérieur à un niveau de courant haut prédéterminé correspondant à la tension sélectionnée,

le niveau de courant bas prédéterminé étant inférieur au niveau de courant haut prédéterminé pour déterminer une plage correspondant au réglage de tension sélectionné; et
déterminer une signalisation correspondante contenant des informations indiquant s'il faut ou non arrêter la pompe (10) après un temps prédéterminé si le courant détecté est inférieur à la valeur de courant bas prédéterminée respective pour fournir une fonctionnalité de contrôleur de protection contre l'assèchement et les surintensités, sur la base au moins partiellement de la signalisation reçue, **caractérisé par**
un adaptateur de puissance (250) ayant des réglages de tension, chaque réglage de tension étant configuré pour être réglé par un utilisateur pour fournir la tension sélectionnée correspondant au débit différent sélectionné par l'utilisateur pour une application particulière, l'adaptateur de puissance (250) étant configuré pour répondre au réglage de tension sélectionné par l'utilisateur et pour fournir la tension sélectionnée correspondant au réglage de tension, et
le processeur de signal (12) faisant partie d'un assemblage de carte de circuits imprimés (120), auquel il est fait référence ci-après en tant que PCBA.

2. Système de pompe (100) selon la revendication 1, dans lequel chaque réglage de tension correspond à un débit respectif de la pompe (10).

3. Système de pompe (100) selon la revendication 1, dans lequel les réglages de tension incluent au moins deux réglages de tension sélectionnés dans

un groupe se composant d'un réglage de 6 volts, d'un réglage de 9 volts, d'un réglage de 12 volts, d'un réglage de 18 volts et d'un réglage de 24 volts.

4. Système de pompe (100) selon la revendication 1, dans lequel le PCBA (120) est configuré pour recevoir une signalisation détectée en provenance d'un capteur d'alimentation de fluide, ou d'un capteur de pression, ou d'un capteur de niveau de fluide, et déterminer s'il faut ou non arrêter la pompe (10) après le temps prédéterminé, sur la base au moins partiellement de la signalisation détectée reçue, incluant quand le capteur d'alimentation de fluide, le capteur de pression ou le capteur de niveau de fluide est activé.

5. Système de pompe (100) selon la revendication 1, dans lequel le processeur de signal (12) est configuré pour mettre en œuvre un processus de démarrage comprenant:

la détection de la tension sélectionnée qui est fournie depuis l'adaptateur de puissance (250) au moteur (14a); et soit
dans lequel le processus de démarrage comprend:

l'amorçage de la pompe (10) à la tension sélectionnée, et soit l'arrêt de la pompe (10) après le temps prédéterminé si la pompe (10) ne s'amorce pas,
soit le fonctionnement de la pompe (10) si la pompe (10) s'amorce,
soit le processeur de signal (12) est configuré pour mettre en œuvre un processus de mode de fonctionnement normal comprenant:

la détermination si la pompe (10) subit un premier tirage de courant par la comparaison d'un courant détecté qui est tiré par la pompe (10) à une valeur de courant bas déterminée respective correspondant à la tension sélectionnée détectée, et
l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est inférieur à la première valeur de courant prédéterminée respective; soit
le processus de mode de fonctionnement normal inclut:

la détermination si la pompe (10) subit un second tirage de courant par la comparaison d'un courant détecté qui est tiré par la pompe (10) à une valeur de courant haut prédéterminée, et
l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est supérieur à la valeur de courant haut prédéterminée.

6. Système de pompe (100) selon la revendication 1, dans lequel
le processeur de signal (12) est configuré pour mettre en œuvre un processus de mode de fonctionnement normal comprenant:

la détermination si la pompe (10) subit un premier tirage de courant par la comparaison d'un courant détecté qui est tiré par la pompe (10) à une valeur de courant bas prédéterminée respective correspondant à la tension sélectionnée, et
l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est inférieur à la première valeur de courant bas prédéterminée respective; ou
le processus de mode de fonctionnement normal inclut:

la détermination si la pompe (10) subit un second tirage de courant par la comparaison du courant détecté qui est tiré par la pompe (10) à une valeur de courant haut prédéterminée; et
l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est supérieur à la valeur de courant haut prédéterminée respective.

7. Système de pompe (100) selon la revendication 5, dans lequel soit la seconde valeur de courant prédéterminée est une valeur de courant haut prédéterminée respective correspondant à la tension sélectionnée détectée, soit la valeur de courant haut prédéterminée est une seconde valeur de courant unique pour n'importe quelle tension sélectionnée détectée.

8. Système de pompe (100) selon la revendication 5, dans lequel le processus de mode de fonctionnement normal inclut:

la détermination si la pompe (10) subit un second tirage de courant par la comparaison du courant détecté qui est tiré par la pompe (10) à une valeur de courant haut prédéterminée; et
l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est supérieur à la valeur de courant haut prédéterminée.

9. Système de pompe (100) selon la revendication 1, dans lequel le processus de mode de fonctionnement normal inclut:

la détermination si la pompe (10) subit un second tirage de courant par la comparaison d'un courant détecté qui est tiré par la pompe (10) à une valeur de courant haut prédéterminée; et l'arrêt de la pompe (10) après le temps prédéterminé si le courant détecté est supérieur à la valeur de courant haut prédéterminée respective.

10. Système de pompe (100) selon la revendication 4, dans lequel le capteur de pression est configuré pour détecter une pression de fluide, et fournir un signal de pression de fluide contenant des informations relatives à la pression de fluide.

11. Système de pompe (100) selon la revendication 4, dans lequel le capteur de niveau de fluide est configuré pour détecter un niveau de fluide, et fournir un signal de niveau de fluide contenant des informations relatives au niveau de fluide.

12. Système de pompe (100) selon la revendication 1, dans lequel la pompe comprend un commutateur marche/arrêt ayant un voyant intégré.

13. Système de pompe (100) selon la revendication 12, dans lequel le voyant intégré est configuré pour recevoir une signalisation de commande de voyant et soit s'allumer lorsque la pompe (10) est en fonctionnement soit clignoter lorsque la pompe (10) est arrêtée, et le processeur de signal (12) est configuré pour fournir la signalisation de commande de voyant.

14. Système de pompe (100) selon la revendication 1, dans lequel le système de pompe (100) est configuré en tant qu'un système de pompe d'un seul tenant de sorte que la pompe (10) contienne l'adaptateur de puissance (250); et la pompe (10) comprend un logement, incluant un logement de moteur (110); et les réglages de tension sont adaptés pour s'étendre à l'extérieur et hors du logement de la pompe (10) pour être sélectionnés par l'utilisateur.

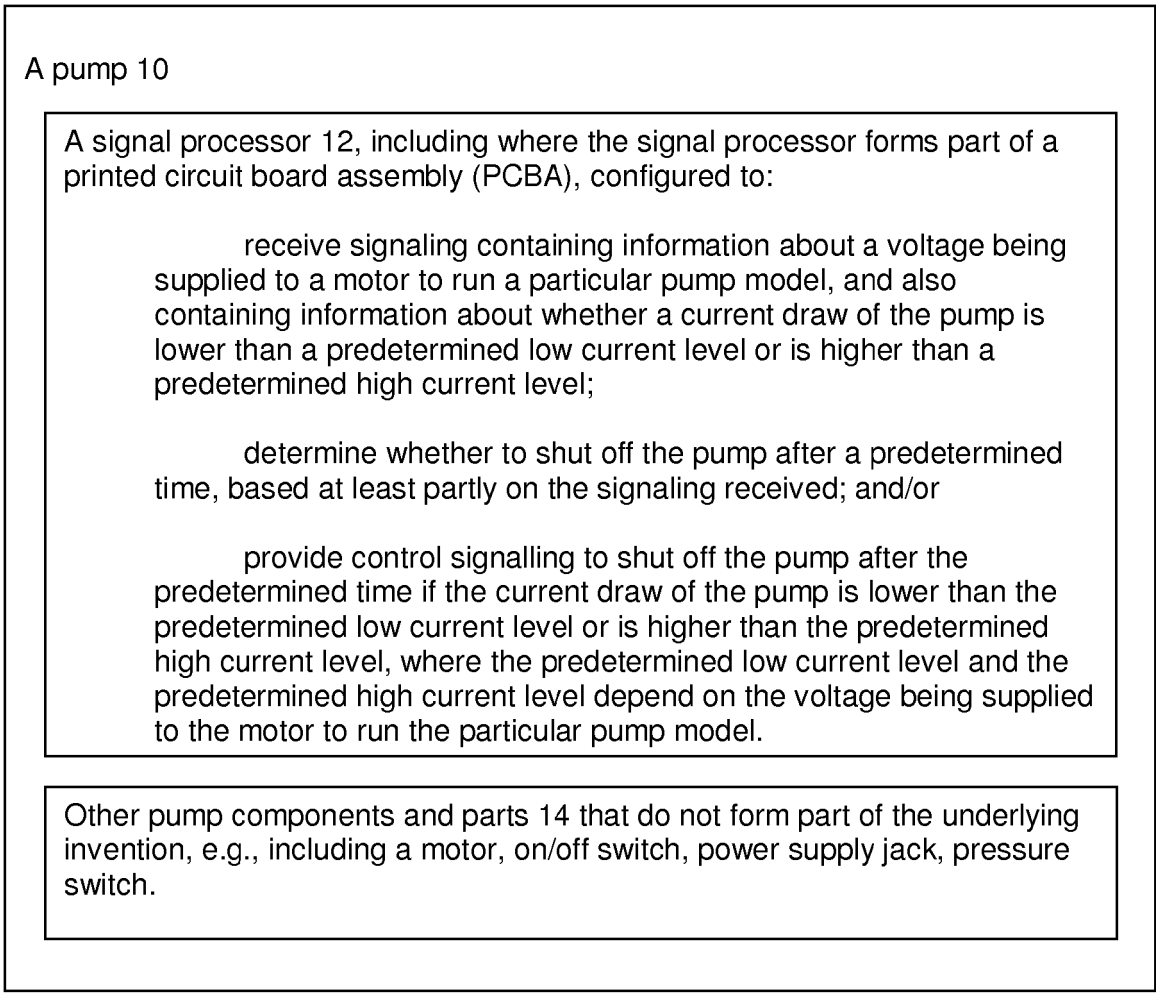

A pump 10
A signal processor 12, including where the signal processor forms part of a printed circuit board assembly (PCBA), configured to:
receive signaling containing information about a voltage being supplied to a motor to run a particular pump model, and also containing information about whether a current draw of the pump is lower than a predetermined low current level or is higher than a predetermined high current level;
determine whether to shut off the pump after a predetermined time, based at least partly on the signaling received; and/or
provide control signalling to shut off the pump after the predetermined time if the current draw of the pump is lower than the predetermined low current level or is higher than the predetermined high current level, where the predetermined low current level and the predetermined high current level depend on the voltage being supplied to the motor to run the particular pump model.
Other pump components and parts 14 that do not form part of the underlying invention, e.g., including a motor, on/off switch, power supply jack, pressure switch.

Figure 1

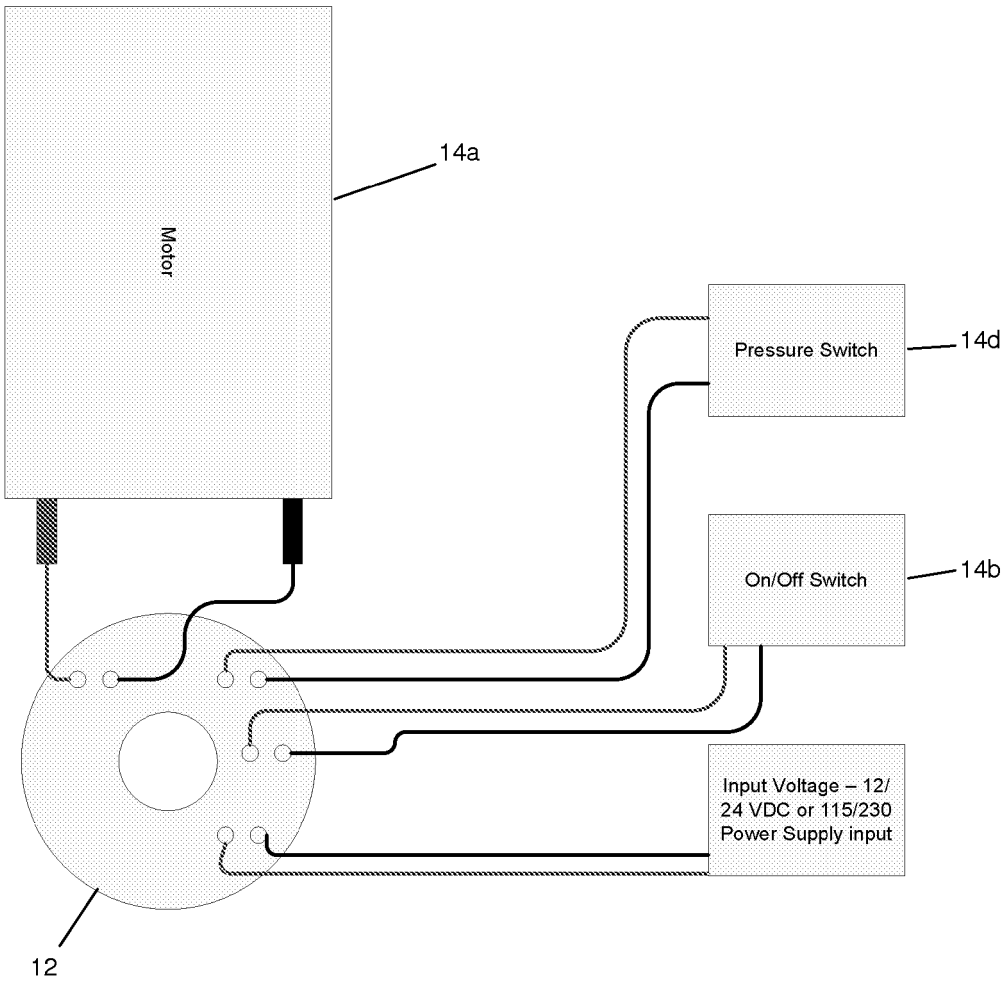

Motor
14a
Pressure Switch
14d
On/Off Switch
14b
Input Voltage – 12/
24 VDC or 115/230
Power Supply input
12

Figure 2

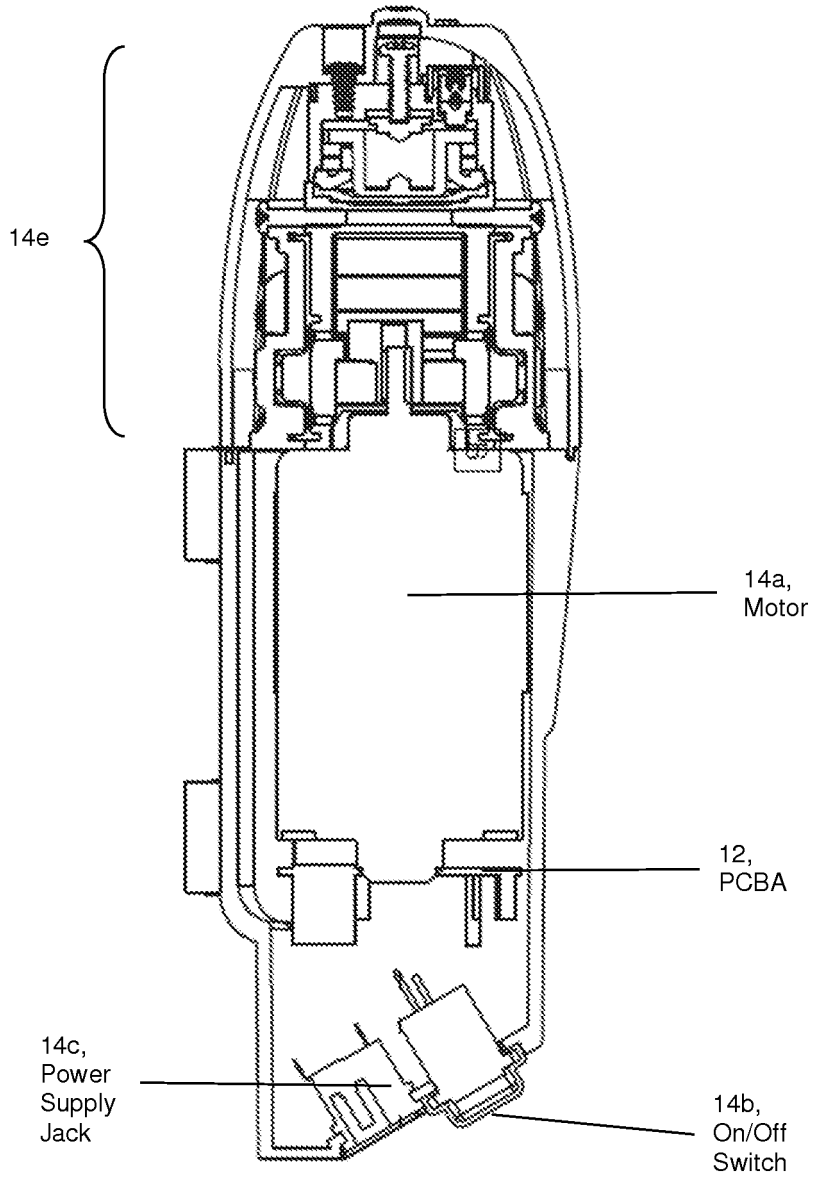


Figure 3

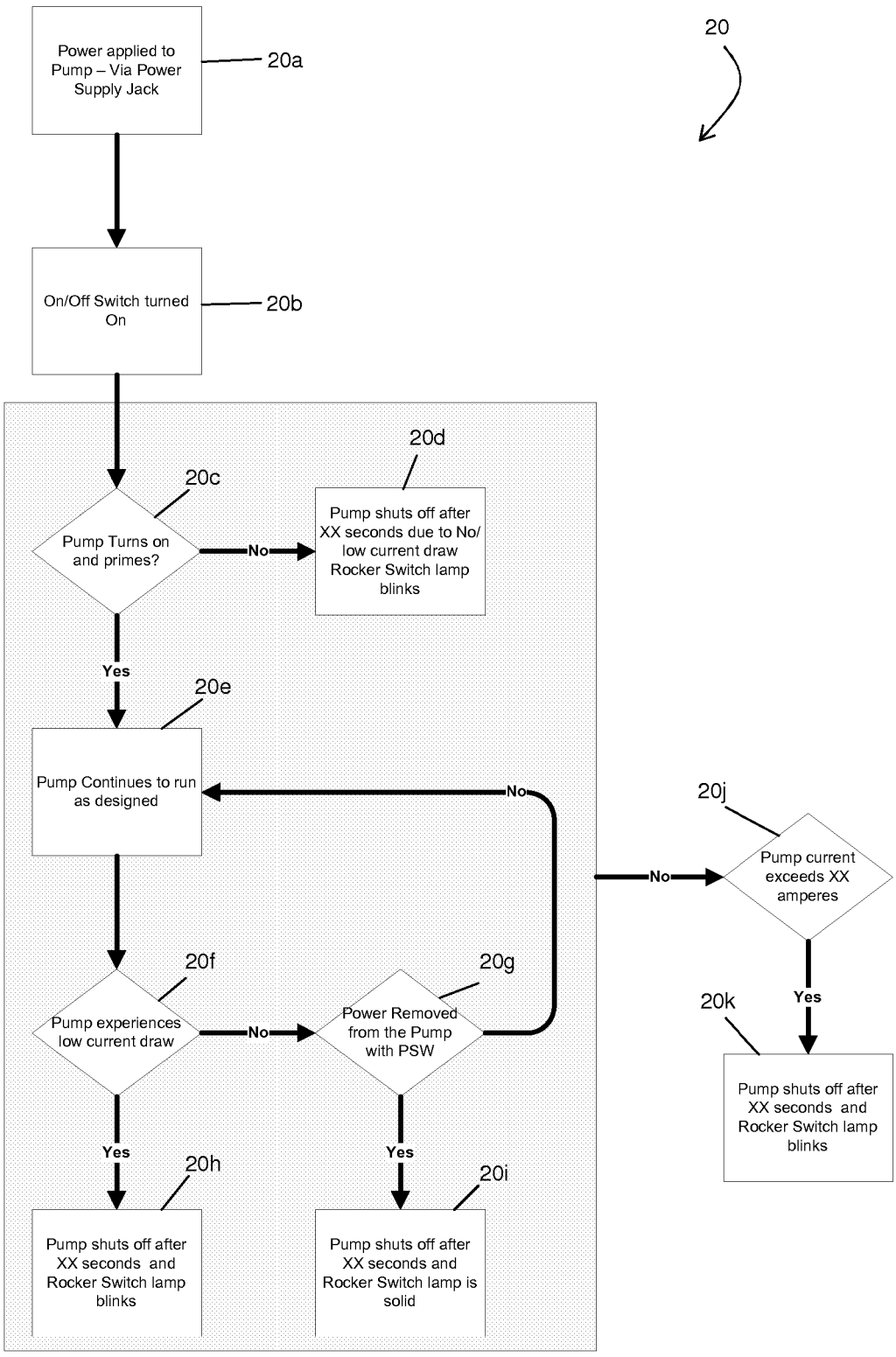

20
Power applied to Pump – Via Power Supply Jack
20a
On/Off Switch turned On
20b
20c
Pump Turns on and primes?
No
20d
Pump shuts off after XX seconds due to No/ low current draw Rocker Switch lamp blinks
Yes
20e
Pump Continues to run as designed
No
20j
Pump current exceeds XX amperes
No
Yes
20k
Pump shuts off after XX seconds and Rocker Switch lamp blinks
20f
Pump experiences low current draw
No
20g
Power Removed from the Pump with PSW
Yes
20h
Pump shuts off after XX seconds and Rocker Switch lamp blinks
Yes
20i
Pump shuts off after XX seconds and Rocker Switch lamp is solid

Figure 4

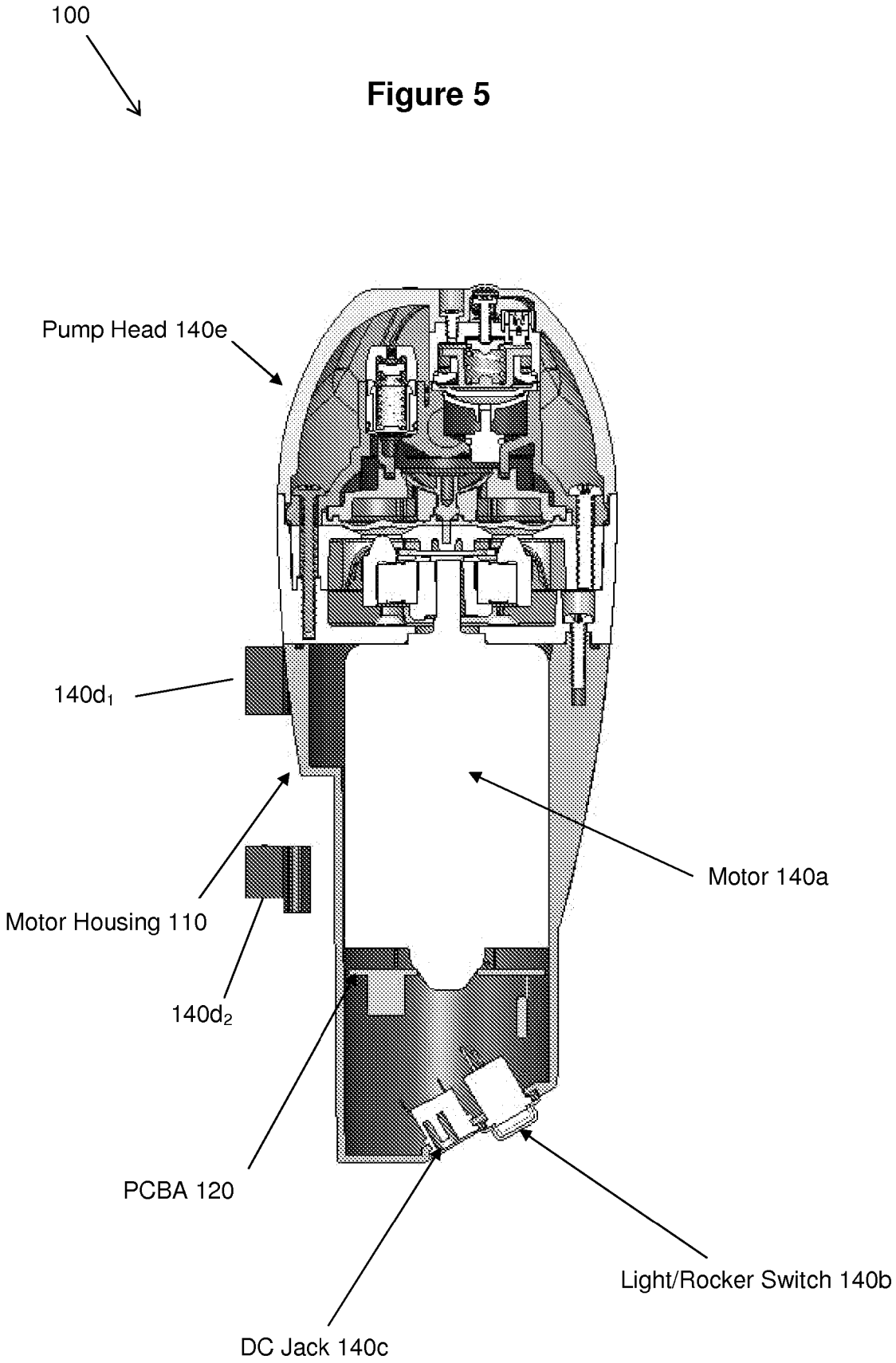

100
Pump Head 140e
140d1
Motor Housing 110
140d2
PCBA 120
DC Jack 140c
Motor 140a
Light/Rocker Switch 140b

Figure 5

Figure 6

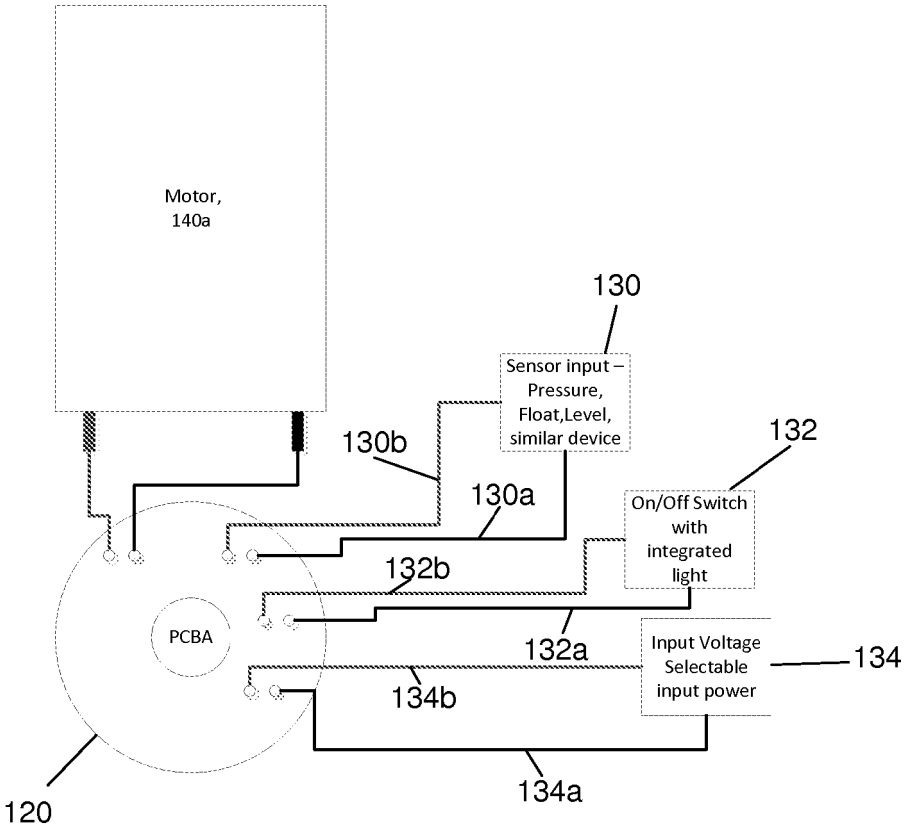
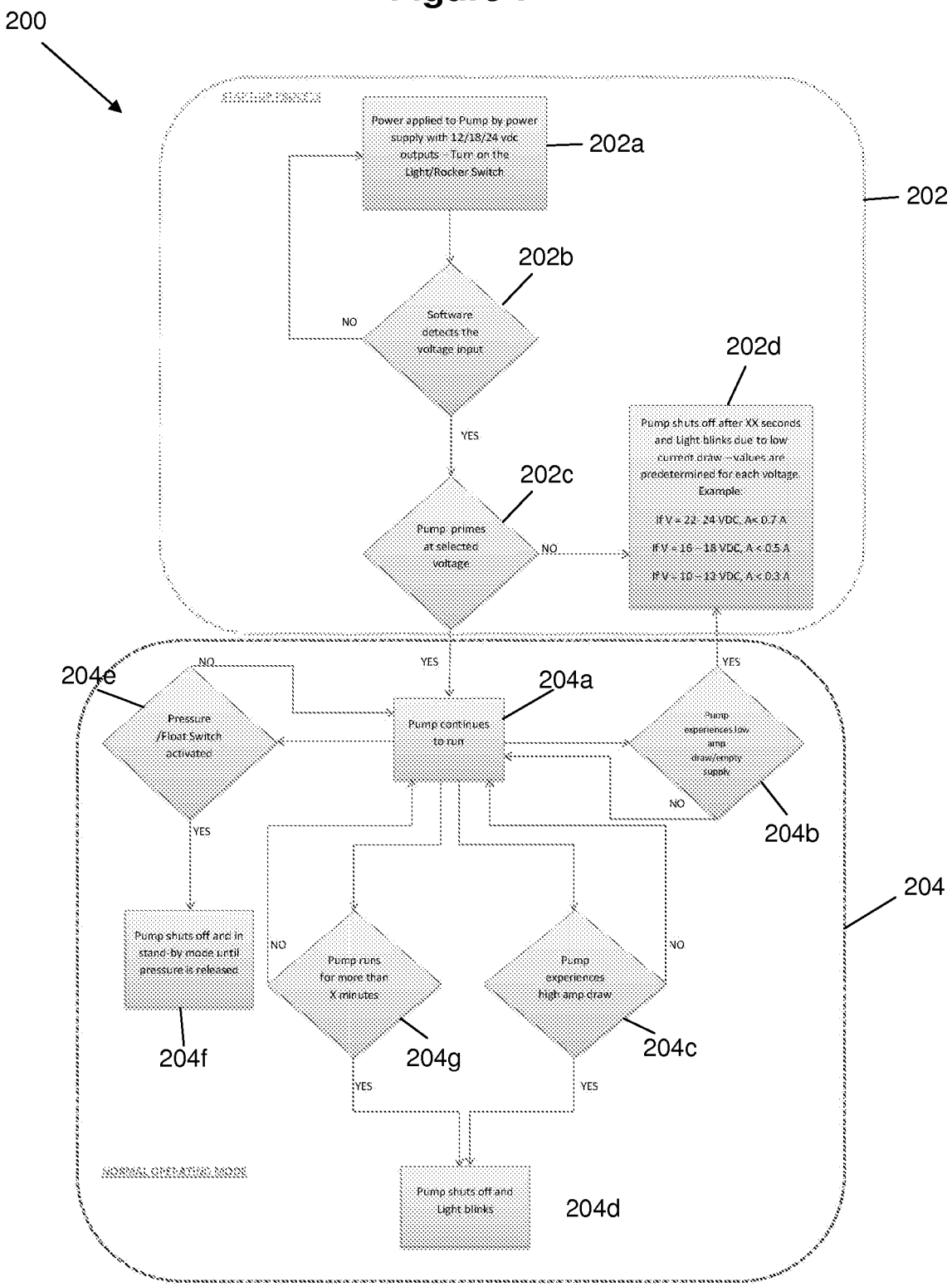

Motor,
140a
130
Sensor input –
Pressure,
Float,Level,
similar device
130b
130a
132
On/Off Switch
with
integrated
light
132b
PCBA
132a
Input Voltage
Selectable
input power
134
134b
134a
120

Figure 7


200
202
202a
Power applied to Pump by power supply with 12/18/24 vdc outputs – Turn on the Light/Rocker Switch
202b
Software detects the voltage input
NO
YES
202c
Pump primes at selected voltage
NO
202d
Pump shuts off after XX seconds and Light blinks due to low current draw – values are predetermined for each voltage. Example:
If V = 22 - 24 VDC, A< 0.7 A
If V = 16 – 18 VDC, A < 0.5 A
If V – 10 – 13 VDC, A < 0.3 A
204
204a
Pump continues to run
204b
Pump experiences low amp draw/empty supply
NO
YES
204c
Pump experiences high amp draw
NO
YES
204d
Pump shuts off and Light blinks
204e
Pressure /Float Switch activated
NO
YES
204f
Pump shuts off and in stand-by mode until pressure is released
204g
Pump runs for more than X minutes
NO
YES

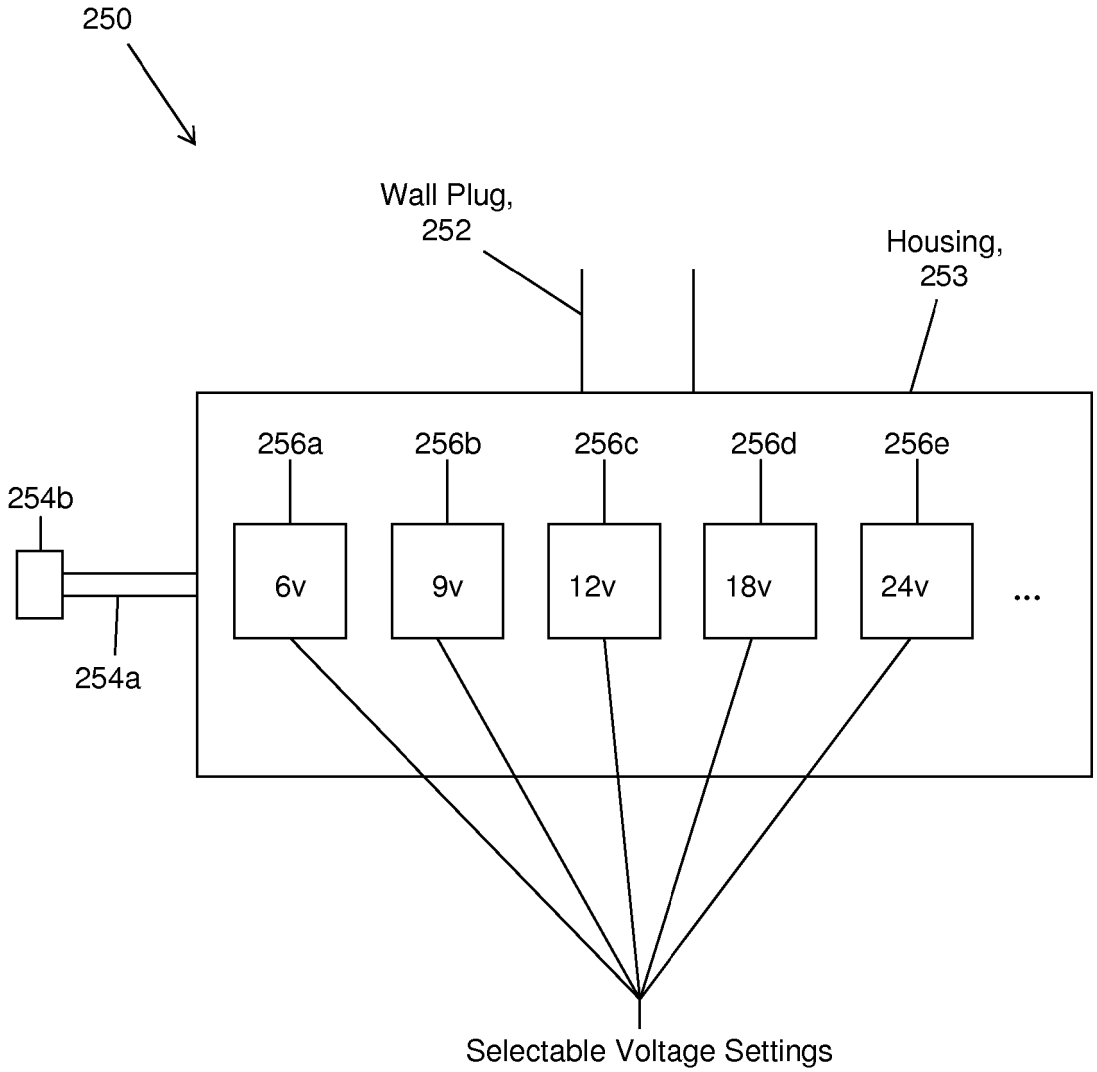


Figure 8: Power Adapter

REFERENCES CITED IN THE DESCRIPTION

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- US 20040265135 A **[0005]**
- US 20060130504 A **[0006]**
- WO 13708075 A **[0033]**
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