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(71) Applicant (for all designated States except US): **NOVA CONTROLS** [US/US]; 225 Westridge Drive, Watsonville, CA 95076 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **YANKEE, Wayne** [US/US]; 6310 Nepo Drive, San Jose, CA 95119 (US). **HOWLAND, David** [US/US]; 230 Campus Drive, Aptos, CA 95003 (US). **CHRISTA, Scott** [US/US]; 3355 Loma Alta Lane, Santa Cruz, CA 95065 (US).

(74) Agents: **STALLARD, David, S.** et al.; Wood, Herron & Evans, L.l.p., 441 Vine Street, 2700 Carew Tower, Cincinnati, OH 45202 (US).

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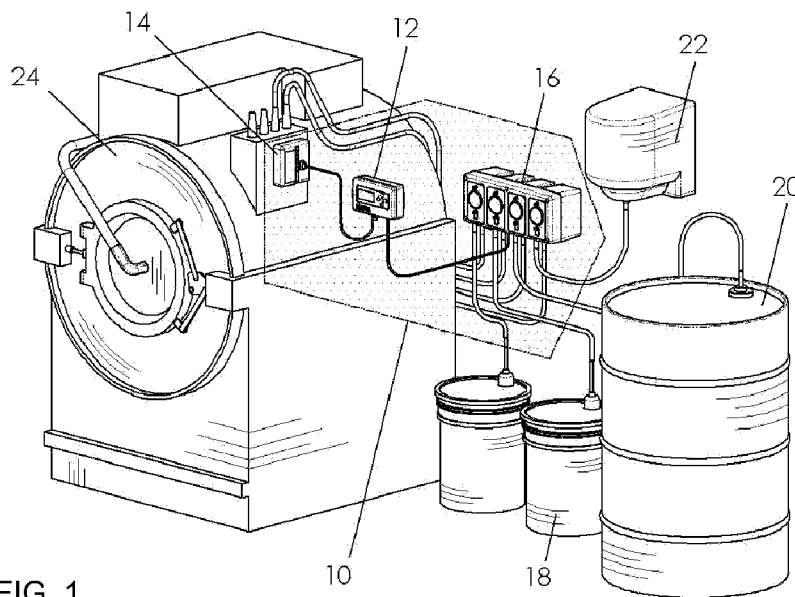


FIG. 1

(57) Abstract: A chemical dispensing system (10) is provided having a microcontroller (12) and at least one expansion module (30). The expansion module (30) includes an expansion module interface. The expansion module (30) is in communication with the micro-controller (12) via the expansion module interface. The at least one expansion module (30) expands capabilities of the chemical dispensing system (10) beyond a base operation of the device.

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CONTROL FOR DISPENSING SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application Serial No. 61/050,340, filed on 5 May 2008 and entitled CONTROL FOR DISPENSING SYSTEM, the disclosure of which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The invention relates generally to chemical dispensing systems for laundry, ware-wash, and healthcare, and more particularly to the transfer and input of data related to the operation of the chemical dispensing control.

BACKGROUND OF THE INVENTION

[0003] The dispensing of liquid chemical products from one or more chemical receptacles is a common requirement of many industries, such as the laundry, textile, ware wash, healthcare instruments, and food processing industries. For example, in an industrial laundry facility, one of several operating washing machines will require, from time to time, aqueous solutions containing quantities of alkaloid, detergent, bleach, starch, softener and/or sour.

[0004] Increasingly, such industries have turned to automated methods and apparatus systems for dispensing chemical products. Such automated methods and apparatus systems provide increased control of product use and minimize human contact with potentially hazardous chemicals.

[0005] Contemporary automatic chemical dispensing systems used in industry require pumps for the liquid chemical products. Generally, these pumps deliver raw chemical product directly to a machine for use or to a dilution manifold or container where the chemical product is mixed with a diluent, typically water. Such systems are relatively simple in concept, but they can be expensive to build and operate. A number of methods for the control of dispensing chemicals have been developed and employed and are well known in the art. Each method generally

utilizes techniques that require a means of input, typically through direct user interface or connectivity to a host device, e.g. Personal Computer (PC), not always available in the immediate environment, and provides limited features and capabilities through "out-of-the-box versions" of the devices. This is usually accomplished with a micro-controller built into the dispensing system or as an integral portion of the system. While these systems expand the capabilities of the dispensing systems, they are also limited in scope and are difficult to update with additional or new features and capabilities. Additionally, other more specialized modules may require specialized connections and/or complicated wiring in order to be used with contemporary dispensing systems.

[0006] It is therefore desirable to have the ability to move data to and from, or connect additional devices to an intelligent dispensing system.

SUMMARY OF THE INVENTION

[0007] A chemical dispensing system is provided including a micro-controller and at least one expansion module. The expansion module has an expansion module interface for communicating with the micro-controller or other components of the chemical dispensing system. The expansion module is in communication with the components of the chemical dispensing system via the expansion module interface. The expansion module expands the capabilities of the chemical dispensing system beyond a base operation of the system.

[0008] In some embodiments, the expansion module interface includes a uni-directional communication link, while in other embodiments the expansion module interface includes a bi-directional communication link. In some embodiments, the micro-controller includes at least one USB port. In these embodiments, the USB port may be used for the communication between an expansion module and the micro-controller.

[0009] In some embodiments, the expansion module interface may be a data storage device. In a particular embodiment having the data storage device, a USB port may be used to read and write chemical dispensing program files. The chemical dispensing program files may be used to automatically configure the chemical

dispensing system. Additionally, the USB port may be used to write chemical dispensing activity reports.

[0010] In some embodiments, the chemical dispensing system includes a computer in communication with the micro-controller. In these embodiments, data may be transferred between the computer and the micro-controller. The data may include: a chemical dispensing program, a single program parameter, activity reports, a single activity report, or combinations thereof. The chemical dispensing system may be configured to include application software for execution on the computer, where the application software may be designed to generate data used for automatically configuring the chemical dispensing system.

[0011] In other embodiments including a computer, the micro controller may be reprogrammed using a local connection with the computer. In still other embodiments including a computer, the micro controller may be reprogrammed using a remote connection with the computer. In some embodiments, the expansion module may provide wireless communication to a machine interface, a pump interface, a machine, additional expansion modules, a computer, or a computer network.

[0012] A method for controlling a chemical dispensing system is also provided. The method includes establishing communication between a micro-controller and an expansion module having an expansion module interface. The capabilities of the chemical dispensing system are expanded beyond a base operation using at least one expansion module.

[0013] In some embodiments, communication between the micro-controller and the expansion module may be established using at least one USB port. Chemical dispensing program files may be read using the USB. Additionally, chemical dispensing program files may be written using the USB. The chemical dispensing system may be automatically configured using the chemical dispensing program files. In some embodiments, wireless communications may be provided using the expansion module to a machine interface, a pump interface, a machine, additional expansion modules, a computer, or a computer network.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention given above, and the detailed description given below, serve to explain the invention.

[0015] FIG. 1 is an illustration of an exemplary base dispensing system and its main components consistent with embodiments of the present invention.

[0016] FIG. 2 is a block diagram of the exemplary dispensing of FIG. 1, including expansion modules.

[0017] FIG. 3 is an illustration of one embodiment of the dispensing system of FIG. 2 with expanded capabilities through add-on devices.

[0018] FIG. 4 illustrates of another one embodiment of the dispensing system of FIG. 2 with expanded capabilities of communication via computer.

[0019] It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various features illustrative of the basic principles of the invention. The specific design features of the sequence of operations as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes of various illustrated components, will be determined in part by the particular intended application and use environment. Certain features of the illustrated embodiments have been enlarged or distorted relative to others to facilitate visualization and clear understanding. In particular, thin features may be thickened, for example, for clarity or illustration.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The present invention addresses limited input/output methods, thus providing improved efficiency and improved programming, as well as a means for expansion of features and expansion of capabilities. Technology embedded within the micro-controller of the system may provide the capability of direct bi-directional communication to multiple types of devices. The input/output of data can be accomplished via display of information on a screen associated with a micro-

controller, through non-volatile memory devices, through computer devices, or through external modules that provide additional means, e.g. wireless communications, network connectivity, etc. This capability may enable an operator to more easily manage chemical programs, monitor chemical usage and/or dispenser activities, make adjustments in dispensing control, monitor system functions, or to increase the capabilities and features of the system without having to implement a new dispensing system itself.

[0021] Embodiments of the present invention address the need to replace equipment to provide additional features and capabilities, or the need to provide a feature-rich system that contains capabilities that are not fully utilized. This is accomplished by embedding technology within the micro-controller of the system, which allows for adding capabilities and features that are not contained within the base system. These capabilities and features can be increased through added modules that connect and utilize the bi-direction communication for a specific single-function or group of functions.

[0022] Turning now to the drawings, FIG. 1 illustrates the structure of an exemplary chemical dispensing system 10. The base configuration of the chemical dispensing system 10 may contain a pump interface 16, a machine interface 14, and a micro-controller 12, which, through wiring and plumbing, connects to containers of chemicals and a machine. The micro-controller 12, may receive inputs from the machine interface 14 and send instructions to the pump interface 16. The pump interface 16 generally provides interfaces between various chemical storage units 18, 20, 22, a dilutant source 23 (FIG. 2) or a machine 24. Machines can vary from a laundry machine to a ware-wash machine to a healthcare wash. One skilled in the art will realize that the machine 24 may represent any type of a machine that uses dispensed chemicals.

[0023] As seen in the block diagram representation of the chemical dispensing system 10 in FIG. 2, the micro-controller 12 may also include interfaces 26 for data transfer devices 28 and expansion modules 30-36. Expansion modules 30-36 may also provide a means of data transfer and source upgrades. Expansion modules 30-36 may be limited to one specific feature or may be a bundle of features and

capabilities. Expansion modules 30-36 may also provide additional interface to chemicals and equipment.

[0024] As illustrated in FIG. 3, add-on devices may be connected to the micro-controller, pump interface or machine interface dependent upon where in the system the expanded capabilities are required or applied. For example, and as seen in FIGS. 2 and 3, some types of expansion units may include an expansion module 30, which may be a proof-of-clean module that would interface between the machine 24 and the micro-controller 12, or between the machine 24 and the machine interface 14, or between an expansion module 36 and the pump interface 16, and be used to monitor functions such as water temperature or chemicals dispensed and communicate this information back to the micro-controller 12. Another expansion unit 32 may include interfaces to additional data transfer units 38, such as the data storage devices as discussed above, network hardware 44 to connect to local area networks (LAN), wide area networks (WAN), or the Internet (TCP/IP). Data transfer device 38 may also include cellular or other modems allowing users to connect remotely to the micro-controller and the dispensing system. Other expansion modules 34 may be a hub to which additional expansion modules 40 attach.

[0025] As seen in FIG. 4, another expansion unit 31 may also include out of product alarm devices, which would connect between the micro-controller 12 or pump interface 16 and a chemical storage unit 18, for example, and be used to monitor the level of the chemical in the chemical storage unit 18 or the flow of chemical from the chemical storage unit 18. The monitor may then be configured to alert an operator or shut down the dispensing system 10 if the chemical level falls below a predetermined level, if the chemical is not flowing within the plumbing, or if it meets other configured conditions.

[0026] There are numerous interfaces that can be used to connect the expansion modules 30-36 to the micro-controller 12 of the dispensing system 10. In some embodiments, the micro-controller 12 may be configured with USB ports. In other embodiments, RS-485 ports may be used as an interface 26. Universal Serial Bus (USB) and RS-485 are examples of serial buses standard to interface devices. Both were designed to allow many peripherals to be connected using a single

standardized interface socket and to improve the plug-and-play capabilities by allowing devices to be connected and disconnected without tearing down the system for a physical upgrade. Other convenient features include providing power to low-consumption devices without the need for an external power supply and allowing many devices to be used without requiring manufacturer specific, individual device drivers to be installed.

[0027] Embodiments of the micro-controller 12 may be configured with USB host functionality, allowing the micro-controller 12 to connect through the USB interface to other devices such as storage systems, network connections or other human interface devices. This type of connection may allow for data to be transferred to and from the micro-controller 12 and could be used, for example, for ease of set-up of the chemical dispensing system and its programming, field upgrades of system software, or data extraction for monitoring of the dispensing system 10.

[0028] Additionally, and as seen in FIG. 4, the serial interface may connect the micro-controller 12 to another computer 42 through an expansion module 34. The connection between the personal computer (PC) and the expansion module 34 may be through a hardwired or wireless connection, thus allowing the micro-controller 12 either local or remote communications with the PC 42 to receive and transmit data, instructions, new programming or the manipulation of data/information through the personal computer (PC).

[0029] While the present invention has been illustrated by a description of one or more embodiments thereof and while these embodiments have been described in considerable detail, they are not intended to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and method, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the scope of the general inventive concept.

WHAT IS CLAIMED IS:

1. A chemical dispensing system comprising:
 - a micro-controller; and
 - at least one expansion module having an expansion module interface, the expansion module in communication with the micro-controller via the expansion module interface,
 - wherein the at least one expansion module expands capabilities of the chemical dispensing system beyond a base operation of the chemical dispensing system.
2. The chemical dispensing system of claim 1, wherein the expansion module interface includes a uni-directional communication link.
3. The chemical dispensing system of claim 1, wherein the expansion module interface includes a bi-directional communication link.
4. The chemical dispensing system of claim 1, wherein the micro-controller comprises:
 - at least one USB port,
 - wherein the at least one USB port is used for the communication between the at least one expansion module and the micro-controller.
5. The chemical dispensing system of claim 4, wherein the expansion module interface is a data storage device.
6. The chemical dispensing system of claim 4, wherein the USB port is used to read and write chemical dispensing program files.
7. The chemical dispensing system of claim 6, wherein the chemical dispensing program files are used to automatically configure the chemical dispensing system.

8. The chemical dispensing system of claim 4, wherein the USB port is used to write chemical dispensing activity reports.
9. The chemical dispensing system of claim 1, further comprising:
 - a computer in communication with the micro-controller,
 - wherein data is transferred between the computer and the micro-controller.
10. The chemical dispensing system of claim 9, wherein the data is selected from a group consisting of: a chemical dispensing program, a single program parameter, activity reports, a single activity report, or combinations thereof.
11. The chemical dispensing system of claim 9, wherein the computer includes:
 - application software executing on the computer,
 - wherein the application software is designed to generate data for automatically configuring the chemical dispensing system.
12. The chemical dispensing system of claim 1, further comprising:
 - a computer in communication with the micro-controller,
 - wherein the micro controller is reprogrammed using a local connection with the computer.
13. The chemical dispensing system of claim 1, further comprising:
 - a computer in communication with the micro-controller,
 - wherein the micro controller is reprogrammed using a remote connection with the computer.
14. The chemical dispensing system of claim 1, wherein the expansion module provides wireless communication to a machine interface, a pump interface, a machine, additional expansion modules, a computer, or a computer network.

15. A method for controlling a chemical dispensing system, the method comprising:
 - establishing communication between a micro-controller and an expansion module having an expansion module interface; and
 - expanding the capabilities of the chemical dispensing system beyond a base operation using the at least one expansion module.
16. The method of claim 15, further comprising:
 - establishing communication between the micro-controller and the expansion module using at least one USB port.
17. The method of claim 16, further comprising:
 - reading chemical dispensing program files using the USB.
18. The method of claim 16, further comprising:
 - writing chemical dispensing program files using the USB.
19. The method of claim 17, further comprising:
 - automatically configuring the chemical dispensing files using the chemical dispensing program files.
20. The method of claim 15, further comprising:
 - providing wireless communication using the expansion module to a machine interface, a pump interface, a machine, additional expansion modules, a computer, or a computer network

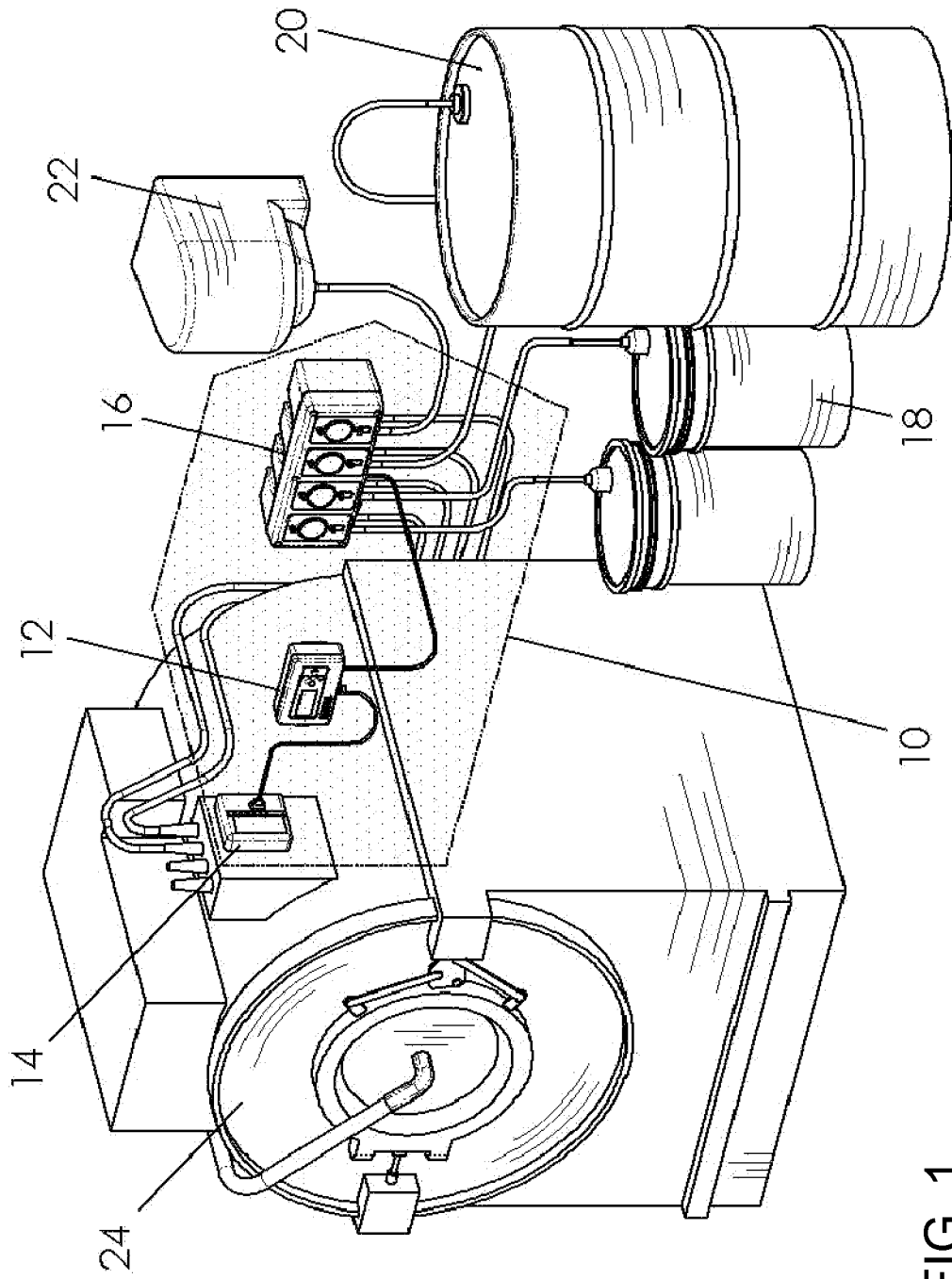


FIG. 1

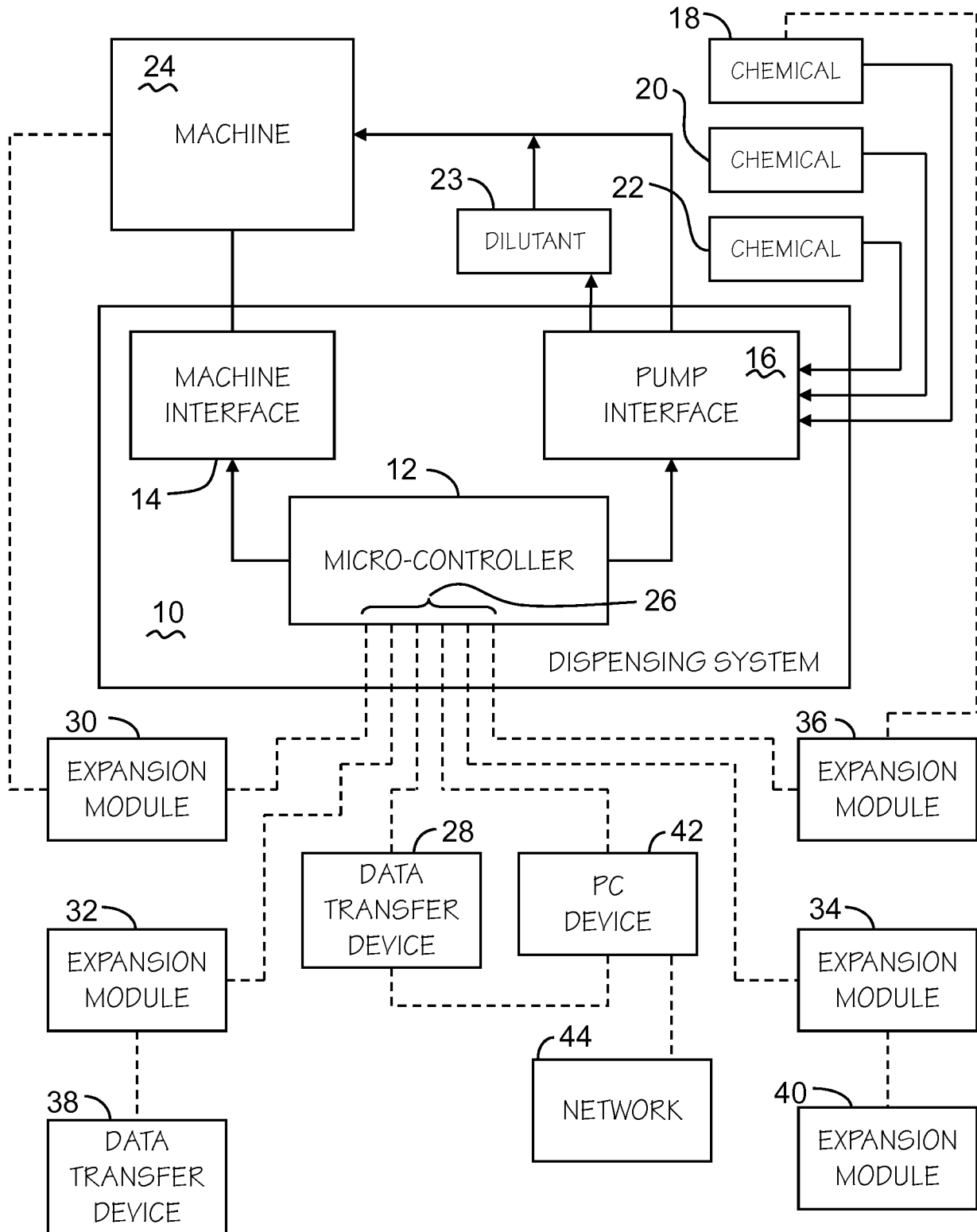


FIG. 2

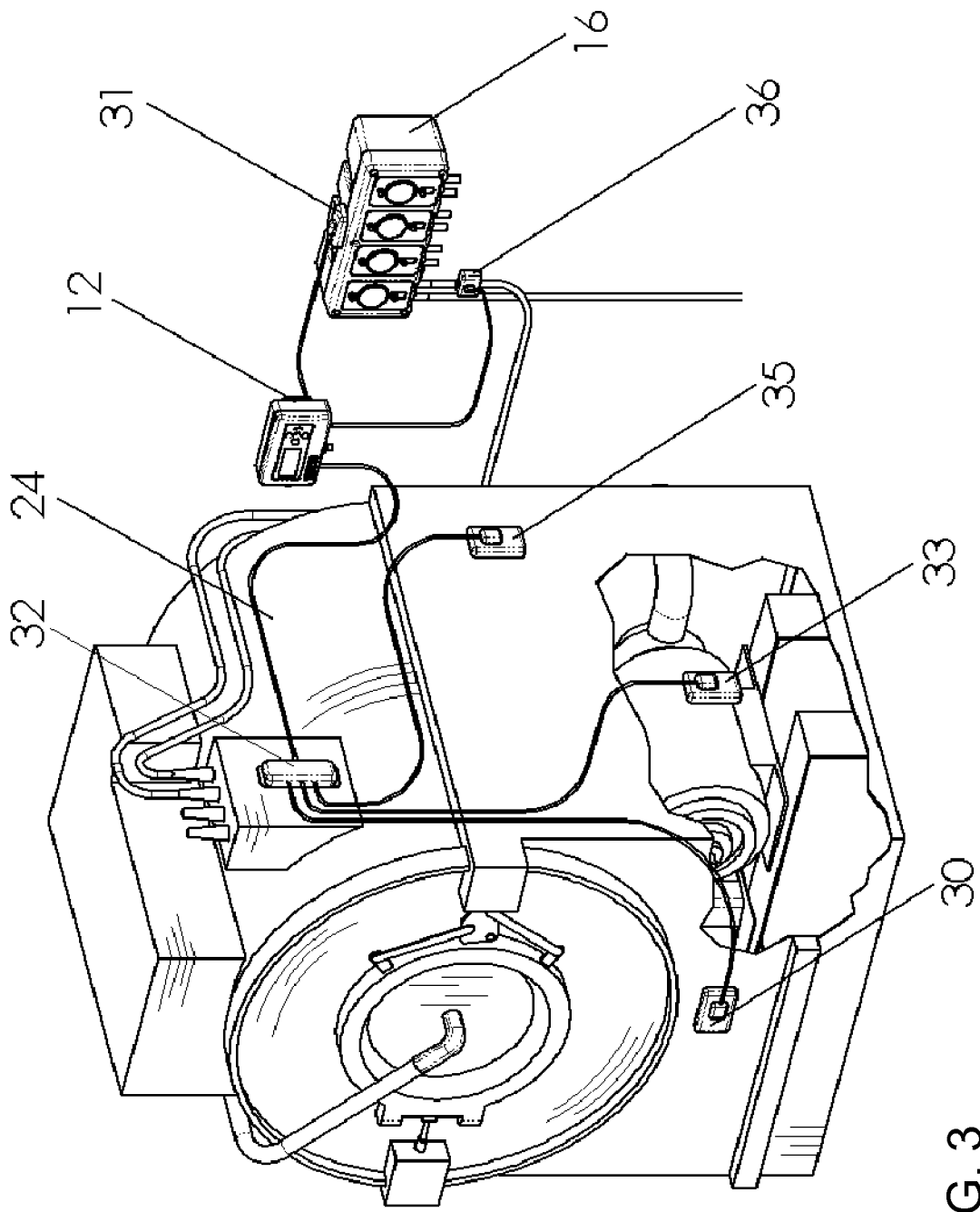


FIG. 3

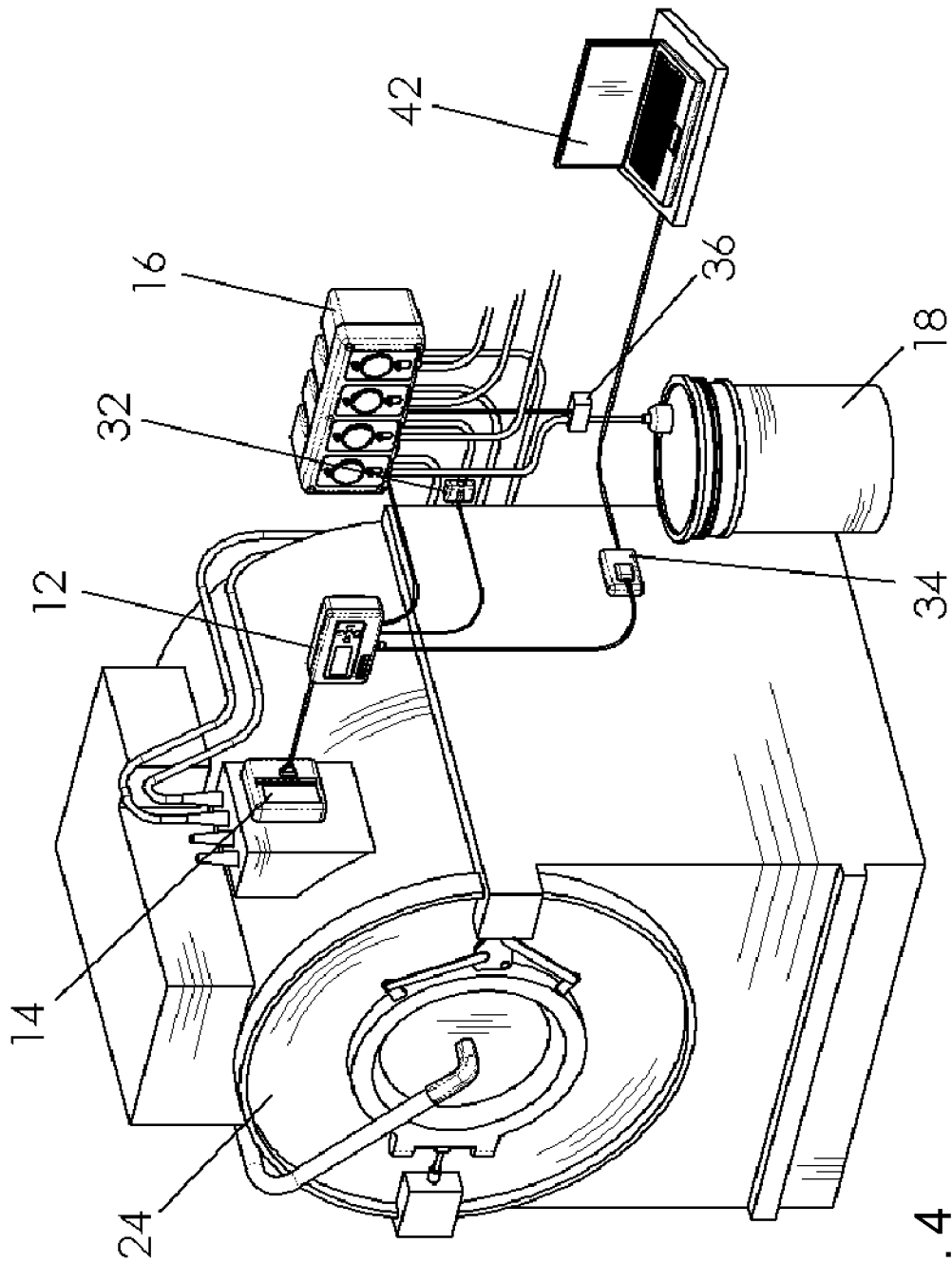


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/042694

| A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - B67D 5/08 (2009.01) USPC - 222/52 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) IPC(8) - B67D 5/08 (2009.01) USPC - 68/12.02; 222/52, 57, 59 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X --- Y | US 2006/0113322 A1 (MASER et al) 01 June 2006 (01.06.2006) entire document | 1-3, 9-15, 20 ----- 4-8, 16-19 |
| Y | US 2007/0118862 A1 (JEONG et al) 24 May 2007 (24.05.2007) entire document | 4-8, 16-19 |
| A | US 5,390,385 A (BELDHAM) 21 February 1995 (21.02.1995) entire document | 1-20 |
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