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SCREENING TOOL

Abstract

In one aspect, a screening tool for detecting whether a predetermined type of liquid is contained in a container includes a sensor arm subsystem in communication with a processing subsystem. The processing subsystem includes a processor disposed in a housing, an AC/DC converter electrically coupled to the processor, and ultrasonic components electrically coupled to the processor and the AC/DC converter. The sensor arm subsystem includes a sensor electrically coupled to the ultrasonic components, a temperature sensor electrically coupled to the processor, and an operator interface electrically couple to the processor.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] The present application claims the benefit of priority under 35 U.S.C. § 119 from U.S. Provisional Patent Application Ser. No. 63/553,411 entitled “Screening Tool,” filed on Feb. 14, 2024, the disclosure of which is hereby incorporated by reference in its entirety for all purposes.

TECHNICAL FIELD
[0003] The present disclosure generally relates to sensors, and more specifically relates to a screening tool including an ultrasonic sensor for detection of liquids in containers.
BACKGROUND
[0004] Liquids can be transported in containers of various sizes ranging from water bottles to fuel tanks. Under certain scenarios, such as for security purposes, it is necessary to detect the type of liquid in the container. As such, there is a desire for a screening tool that can detect a type of liquid in a non-invasive and time efficient manner.
[0005] The description provided in the background section should not be assumed to be prior art merely because it is mentioned in or associated with the background section. The background section may include information that describes one or more aspects of the subject technology.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0006] The accompanying drawings, which are included to provide further understanding and are incorporated in and constitute a part of this specification, illustrate disclosed embodiments and together with the description serve to explain the principles of the disclosed embodiments. In the drawings:
[0007] FIG. **1** is a perspective view of a screening tool positioned for screening a tank containing liquid according to certain aspects of the disclosure.
[0008] FIG. **2** is a perspective front view of a processing subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0009] FIG. **3** is a perspective rear view of the processing subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0010] FIG. **4** is a side view of the processing subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0011] FIG. **5** is a front view of the processing subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0012] FIG. **6** is a top perspective view of the processing subsystem of the screening tool of FIG. **1** with a top removed, according to certain aspects of the disclosure.
[0013] FIG. **7** is a top view of the processing subsystem of the screening tool of FIG. **1** with the top removed, according to certain aspects of the disclosure.
[0014] FIG. **8** is a perspective view of a sensor arm subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0015] FIG. **9** is a front view of the sensor arm subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0016] FIG. **10** is a side view of the sensor arm subsystem of the screening tool of FIG. **1**,

according to certain aspects of the disclosure.
[0017] FIG. **11** schematically illustrates the interconnections of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0018] FIG. **12** is a front view of an interface of the sensor arm subsystem of the screening tool of FIG. **1**, according to certain aspects of the disclosure.
[0019] FIG. **13** illustrates an example process for determining status states of the screening tool.
[0020] In one or more implementations, not all of the depicted components in each figure may be required, and one or more implementations may include additional components not shown in a figure. Variations in the arrangement and type of the components may be made without departing from the scope of the subject disclosure. Additional components, different components, or fewer components may be utilized within the scope of the subject disclosure.

DETAILED DESCRIPTION

[0021] The detailed description set forth below is intended as a description of various implementations and is not intended to represent the only implementations in which the subject technology may be practiced. As those skilled in the art would realize, the described implementations may be modified in various different ways, all without departing from the scope of the present disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature and not restrictive.
[0022] FIG. **1** depicts an environment in which a screening tool **10** can be useful. As is illustrated, the screening tool **10** is positioned for screening a container **12**, which contains a liquid. It should be understood that the screening tool **10** is not necessarily illustrated to scale with respect to the container **12**. The screening tool **10** includes a processing subsystem **14** and a sensor arm subsystem **16**. The processing subsystem **14** is in communication with the sensor arm subsystem **16** via a cable **18**. In the embodiment illustrated in FIG. **1**, the cable **18** serves as a method of communication between the processing subsystem **14** and the sensor arm subsystem **16**; however, in other embodiments, other communication methods or protocols can be incorporated into the screening tool **10**. For example, the components of the screening tool **10** can be arranged to communicate through other methods or protocols, such as, for example, GSM (Global System for Mobile Communications), Short Message Service (SMS), Enhanced Messaging Service (EMS), or Multimedia Messaging Service (MMS) messaging, CDMA (Code Division Multiple Access), Time division multiple access (TDMA), Personal Digital Cellular (PDC), Wideband CDMA, General Packet Radio Service (GPRS), or LTE (Long-Term Evolution), Bluetooth protocols, Wi-Fi networks, RFID technology, and other appropriate communication methods and protocols. As will be described in more detail below, the screening tool **10** is configured to perform non-invasive inspections of containers, such as the container **12**, to detect whether a predetermined type of liquid is contained in the container **12**. In certain aspects, the container **12** is a fuel tank on a vehicle.
[0023] The screening tool **10** is portable and includes a handle **22** mounted on the processing subsystem **14** for carrying. In certain aspects, the screening tool **10** can be transported on a cart **20**. While the cart **20** illustrated in FIG. **1** is a readily accessible utility cart **20**, in certain embodiments the cart can be a customized cart built specifically to transport the screening tool **10** and/or the processing subsystem **14**.
[0024] Referring to FIGS. **2-7**, the processing subsystem **14** of the screening tool **10** includes a housing **24**. The housing **24** can be substantially rectangular in shape, but other shapes are well within the scope of the present disclosure. The handle **22** is affixed to the top of the housing **24** and is configured to allow a user to carry the processing subsystem **14**. Disposed on the front of the housing **24** of the processing subsystem **14** are a power button **26**, a first front fan grill **28**, a second front fan grill **30**, and a first cable strain relief **32**. The first cable strain relief **32** is configured to receive and support the cable **18**. Disposed on the rear of the housing **24** of the processing subsystem **14** are a power receptacle **34**, a first battery mount **36**, a second battery mount **38**, a power switch **40**, a first rear fan grill **42**, a second rear fan grill **44**, and a pair of data ports **46**. The

processing subsystem **14** is illustrated with a pair of data ports **46**; however, in other embodiments, the pair of data ports can be a single data port or three or more data ports depending on the intended implementation of the screening tool **10** and other factors. The power receptacle **34** can be, but is not limited to, an AC power receptacle. The screening tool **10** can be either powered with AC power by connecting a power cord (not illustrated) to the power receptacle **34** or by rechargeable batteries (not shown), which can be secured in the first battery mount **36** and/or the second battery mount **38** during use. When AC power is selected for use, the rechargeable battery would be unsecured from the first battery mount **36** to allow access to the power receptacle **34**. In certain aspects, the power consumption of the screening tool **10** is approximately 50 watts ("W"). The data ports **46** can be any appropriate data port including, but not limited to, USB ports and other appropriate ports. The data ports **46** are configured for receiving various devices such as, but not limited to, a USB hub, a monitor, a mouse, a keyboard, a USB drive to enable data downloads, and other appropriate devices. In certain aspects, the approximate weight of the processing subsystem **14** is 15 lbs.

[0025] With particular reference to FIGS. **6-7** where the top of the housing **24** is removed to reveal components positioned inside the housing **24**, an interior of the processing subsystem **14** includes a power converter **48** (e.g., AC/DC converter), a processor **50** in communication with, and electrically coupled to, ultrasonic components **51** (e.g., pulser/receiver, digital to analog converter (ADC), which are schematically illustrated in FIG. **11**, a first front fan **52**, a second front fan **54**, a first rear fan **56**, and a second rear fan **58**. The first front fan **52** is positioned adjacent to the first front fan grill **28**. The second front fan **54** is positioned adjacent to the second front fan grill **30**. The first rear fan **56** is positioned adjacent to the first rear fan grill **42**. The second rear fan **58** is positioned adjacent to the second rear fan grill **44**. The first front fan **52**, the second front fan **54**, the first rear fan **56**, and the second rear fan **58** are collectively configured to cool the interior of the processing subsystem **14** to facilitate effective operation of the processing subsystem **14**. The processor **50** is configured to detect a previously selected liquid such as, but not limited to, diesel based on ultrasonic wavelength data received from the sensor arm subsystem **16** and characterized across environmental conditions for the previously selected liquid. The processor **50** is configured to control and communicate with the sensor arm subsystem **16**, as described in more detail below. In certain aspects, the processor **50** is electrically couple to the pair of data ports **46** for receiving and transmitting signals to various devices inserted into the pair of data ports **46**. For example, in certain aspects, a data port of the pair of data ports **46** is a USB port configured to enable data downloads to an inserted USB drive.

[0026] Moving to FIGS. **8-10**, the sensor arm subsystem **16** includes a handgrip **60**, a case **62**, an arm **64**, a temperature sensor **66**, and a sensor **68**. One side of the case **62** is coupled to the handgrip **60** while the arm **64** extends from the other opposite side of the case **62**. The temperature sensor **66** can be, but is not limited to, a thermocouple, a thermistor, a resistance temperature detector, a semiconductor-based sensor, and other appropriate sensors capable of reading temperature. The temperature sensor **66** and the sensor **68** are attached to a distal end of the arm **64**. A second cable strain relief **70** is coupled to the handgrip **60** and is configured to receive and support the cable **18**. An operator interface **72** is coupled to the exterior of the case **62**. In certain aspects, a speaker **74** is coupled to the case **62**. The speaker **74** is configured to provide an audio alert when the processor **50** makes certain determinations such as, but not limited to, when presence of a substance other than the previously selected liquid is detected. In certain aspects, the sensor **68** is an ultrasonic sensor configured to send and receive ultrasonic pulses.

[0027] With reference to FIG. **11**, in certain aspects, the cable **18** sheaths a plurality of wires for connecting components of the processing subsystem **14** to components of the sensor arm subsystem **16**. For example, a first wire electrically couples the ultrasonic components **51** to the sensor **68**, a second wire electrically couples the processor **50** to the temperature sensor **66**, a third wire electrically couples the power converter **48** to the temperature sensor **66**, a fourth wire electrically

couples the power converter **48** to the operator interface **72**, and a fifth wire electrically couples the processor **50** to the operator interface **72**. In certain aspects, a sixth wire electrically couples the processor **50** to the speaker **74**. As previously noted, while the embodiment illustrated and described includes wired communication, other embodiments of a screening tool can include various methods of wireless communication.

[0028] With further reference to FIG. **11**, the power converter **48** is electrically coupled to, and in communication with, a number of other components to provide wired power such as the processor **50**, the ultrasonic components **51**, the temperature sensor **66**, and the operator interface **72**. The power converter **48** receives wired power from a power source **76** via the power receptacle **34** and from at least one battery **78**, which can be rechargeable by the power source **76** via a charger **79**. In certain aspects, the power converter **48** can either receive wired power from the power source **76** via the power receptacle **34** or from the at least one battery **78**. The at least one battery **78** can be mounted to the first and second battery mount **36**, **38**. The processor **50** is directly or indirectly in communication with, and electrically coupled to, a number of components such as the ultrasonic components **51** to receive wired signals therefrom, the temperature sensor **66** to receive wired signals therefrom, the operator interface **72** to deliver wired signals thereto, and the power converter **48** to receive wired power therefrom. The ultrasonic components **51** are directly or indirectly in communication with, and electrically coupled to, a number of components such as the sensor **68** to receive wireless signals therefrom and to deliver wired power thereto, the processor **50** to deliver wire signals thereto, and the power converter **48** to receive wired power therefrom.

[0029] As depicted in FIG. **12**, the operator interface **72** of the sensor arm subsystem **16** includes a first indicator **80**, a second indicator **82**, and a button indicator **84**. The first indicator **80** is configured to indicate system status of the screening tool **10** with various lighting for different status. For example, the first indicator **80** can be unlit to indicate that the system status is “off,” can be lit with a first color (such as, but not limited to, green) to indicate that the system status is “system ready to scan,” and can be lit with a second color (such as, but not limited to, red) to indicate that the system status is “system not ready for scan.” The second indicator **82** is configured to indicate scan result status of the screening tool **10** with various lighting for different status. For example, the second indicator **82** can be unlit to indicate that the scan result status is “off,” can be lit with a first color (such as, but not limited to, green) to indicate that the scan made a positive detection of a previously selected liquid, and the scan result status can be lit with a second color (such as, but not limited to, red) to indicate that the scan detected a presence of a substance other than the previously selected liquid. The button indicator **84** is a combination button and indicator. The button of the button indicator **84** is configured to, responsive to engaging the button, start or reset the scan. The indicator of the button indicator **84** is configured to indicate scan status of the screening tool **10** with various lighting for different status. For example, the indicator of the button indicator **84** can be unlit to indicate that the scan status is “off,” can be lit with a first color (such as, but not limited to, green) to indicate a successful scan, can be lit with a flashing first color to indicate that the scan status is in progress, can be lit with a second color (such as, but not limited to, red) to indicate an unsuccessful scan, and can be lit with a flashing second color to indicate that the scan status is in a self-test. The button indicator **84** is strategically positioned on the operator interface **72** such that a user can maintain constant contact with the handgrip **60**.

[0030] FIG. **13** illustrates a flow chart of an example process for determining status states of the first indicator **80**, the second indicator **82**, and the button indicator **84**. As depicted at step **1310**, the screening tool **10** is powered off and the first indicator **80**, the second indicator **82**, and the button indicator **84** are all unlit. When the screening tool **10** is powered on, as illustrated at step **1312**, the processor **50** enters system startup and the first indicator **80**, the second indicator **82**, and the button indicator **84** all remain unlit. After the startup is completed, the processor **50** runs a self-test, as illustrated at step **1314**, and the button indicator **84** is lit with the flashing second color to indicate that the scan status is in the self-test while the first indicator **80** and the second indicator **82** remain

unlit. The processor **50** determines at step **1316** whether the self-test passes. When the processor **50** determines that the self-test passed the screening tool **10** proceeds to standby, as depicted at step **1318**, and the first indicator **80** is lit with the first color to indicate that the system status is “system ready to scan” while the second indicator **82** and the button indicator **84** remain unlit. On the other hand, when the processor **50** determines that the self-test has not passed, as depicted at step **1320**, the first indicator **80** is lit with the second color to indicate that the system status is “system not ready for scan” while the second indicator **82** and the button indicator **84** remain unlit. While not illustrated, the foregoing combinations can be documented either in a manual or on the sensing tool **10** to assist an operator who is operating the sensing tool **10**.

[0031] As illustrated at step **1322**, responsive to the button of the button indicator **84** being engaged, the processor **50** begins the scanning process such that the first indicator **80** is lit with the first color to indicate that the system status is “system ready to scan,” the button indicator **84** is lit with the flashing first color to indicate that the scan status is in progress, and the second indicator **82** is unlit. When the processor **50** determines that the scan has timed out or the button of the button indicator **84** has been engaged during the scanning process, as depicted at step **1324**, the processor **50** stops the scanning process and changes the indicator of the button indicator **84** to be lit with the second color to indicate an unsuccessful scan while the first indicator **80** remains lit with the first color to indicate that the system status is “system ready for scan” and the second indicator **82** remains unlit. If the button of the button indicator **84** is engaged again after step **1324**, then the process proceeds to step **1318**.

[0032] After step **1322** when the scan is completed, the processor **50** determines whether the scan result is valid, as depicted at step **1326**. When the processor **50** determines that the scan result is not valid, as depicted at step **1328**, the first indicator **80** remains lit with the first color to indicate that the system status is “system ready for scan,” the second indicator **82** will remain unlit, and the button indicator **84** will be lit with the second color to indicate an unsuccessful scan. If the button of the button indicator **84** is engaged again after step **1328**, then the process with proceed to step **1318**. When the processor **50** instead determines that the scan result is valid at step **1326** the processor **50** then determines whether the previously selected liquid is detected, as depicted at step **1330**. When the processor **50** determines that the previously selected liquid is detected, as illustrated at step **1332**, the first indicator **80** remains lit with the first color to indicate that the system status is “system ready for scan,” the second indicator **82** will be lit with the first color to indicate that the scan made a positive detection of the previously selected liquid, and the button indicator **84** will be lit with the first color to indicate the successful scan. If the button of the button indicator **84** is engaged again after step **1332**, then the process proceeds to step **1318**.

[0033] When the processor **50** determines that the previously selected liquid is not detected at step **1330** the processor **50** completes the scan and indicates that an unknown substance is detected, as illustrated at step **1334**, such that the first indicator **80** remains lit with the first color to indicate that the system status is “system ready for scan,” the second indicator **82** is lit with the first color to indicate that the scan detected a presence of a substance other than the previously selected liquid, and the button indicator **84** is lit with the second color to indicate that the scan was successfully completed.

[0034] In operation, the power button **26** and the power switch **40** are engaged to power on the screening tool **10**. Once powered on, the processor **50** will conduct the self test. After the processor **50** determines that the self test passed, a user of the screening tool **10** can position the sensor **68** of sensor arm subsystem **16** proximate the container **12**. Preferably, the sensor **68** is positioned at an end of the container **12** such that the sensor **68** sends ultrasonic pulses through the end and length of the container **12** and receives echoes of the pulses that bounce off the other end of the container **12**. With the sensor **68** of the sensor arm subsystem **16** properly placed proximate the end of the container **12**, the user can engage the button of the button indicator **84** to initiate the scan. During the scan, the sensor **68** sends ultrasonic pulses through the end and length of the container **12** and

receives the echo of the pulses that bounce off the other end of the container **12**. The sensor **68** then sends the received echo pulses to the ultrasonic components **51**, which sends them to the processor **50** to determine whether the scan result is valid and whether the previously selected liquid is detected.

[0035] While not illustrated, the foregoing combinations can be documented either in a manual or on the sensing tool **10** to assist an operator who is operating the sensing tool **10**.

[0036] The word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any embodiment described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other embodiments. Phrases such as an aspect, the aspect, another aspect, some aspects, one or more aspects, an implementation, the implementation, another implementation, some implementations, one or more implementations, an embodiment, the embodiment, another embodiment, some embodiments, one or more embodiments, a configuration, the configuration, another configuration, some configurations, one or more configurations, the subject technology, the disclosure, the present disclosure, other variations thereof and alike are for convenience and do not imply that a disclosure relating to such phrase(s) is essential to the subject technology or that such disclosure applies to all configurations of the subject technology. A disclosure relating to such phrase(s) may apply to all configurations, or one or more configurations. A disclosure relating to such phrase(s) may provide one or more examples. A phrase such as an aspect or some aspects may refer to one or more aspects and vice versa, and this applies similarly to other foregoing phrases.

[0037] A reference to an element in the singular is not intended to mean “one and only one” unless specifically stated, but rather “one or more.” The term “some” refers to one or more. Relational terms such as first and second and the like may be used to distinguish one entity or action from another without necessarily requiring or implying any actual such relationship or order between such entities or actions. All structural and functional equivalents to the elements of the various configurations described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and intended to be encompassed by the subject technology. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the above description. No claim element is to be construed under the provisions of 35 U.S.C. § 112, sixth paragraph, unless the element is expressly recited using the phrase “means for” or, in the case of a method claim, the element is recited using the phrase “step for”.

[0038] While this specification contains many specifics, these should not be construed as limitations on the scope of what may be claimed, but rather as descriptions of particular implementations of the subject matter. Certain features that are described in this specification in the context of separate embodiments can also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable subcombination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a subcombination or variation of a subcombination.

[0039] The subject matter of this specification has been described in terms of particular aspects, but other aspects can be implemented and are within the scope of the following claims. For example, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. The actions recited in the claims can be performed in a different order and still achieve desirable results. As one example, the processes depicted in the accompanying figures do not necessarily require the particular order shown, or sequential order, to achieve desirable results. In certain circumstances, multitasking and

parallel processing may be advantageous.
[0040] The title, background, brief description of the drawings, abstract, and drawings are hereby incorporated into the disclosure and are provided as illustrative examples of the disclosure, not as restrictive descriptions. It is submitted with the understanding that they will not be used to limit the scope or meaning of the claims. In addition, in the detailed description, it can be seen that the description provides illustrative examples and the various features are grouped together in various implementations for the purpose of streamlining the disclosure. The method of disclosure is not to be interpreted as reflecting an intention that the claimed subject matter requires more features than are expressly recited in each claim. Rather, as the claims reflect, inventive subject matter lies in less than all features of a single disclosed configuration or operation. The claims are hereby incorporated into the detailed description, with each claim standing on its own as a separately claimed subject matter.
[0041] The claims are not intended to be limited to the aspects described herein, but are to be accorded the full scope consistent with the language claims and to encompass all legal equivalents. Notwithstanding, none of the claims are intended to embrace subject matter that fails to satisfy the requirements of the applicable patent law, nor should they be interpreted in such a way.

Claims

1. A screening tool for detecting whether a predetermined type of liquid is contained in a container, the screening tool comprising: a processing subsystem comprising a housing, a processor disposed in the housing, an AC/DC converter electrically coupled to the processor, ultrasonic components electrically coupled to the processor and the AC/DC converter; and a sensor arm subsystem in communication with the processing subsystem, the sensor arm subsystem comprising a sensor electrically coupled to the ultrasonic components, a temperature sensor electrically coupled to the processor, an operator interface electrically coupled to the processor.
2. The screening tool of claim 1, wherein the sensor is an ultrasonic sensor configured to send and receive ultrasonic pulses.
3. The screening tool of claim 1, wherein the temperature sensor is one of a thermocouple, a thermistor, a resistance temperature detector, and a semiconductor-based sensor.
4. The screening tool of claim 1, wherein the sensor arm subsystem further comprises a case, wherein the operator interface is coupled to the case, a handgrip coupled to the case, an arm extending from the case, wherein the sensor and the temperature sensor are attached to a distal end of the arm.
5. The screening tool of claim 1, wherein the operator interface comprises a first indicator, a second indicator, and a button indicator.
6. The screening tool of claim 1, wherein the processing subsystem further comprises a pair of data ports electrically coupled to the processor, wherein the pair of data ports are configured to enable data downloads.
7. The screening tool of claim 1, wherein the processing subsystem further comprises at least one front fan grill disposed on a front of the housing, at least one rear fan grill disposed on a rear of the housing, and at least one battery mount disposed on the rear of the housing.
8. The screening tool of claim 7, wherein the processing subsystem further comprises at least one front fan positioned adjacent to the at least one front fan grill, and at least one rear fan positioned adjacent to the at least one rear fan grill.
9. The screening tool of claim 1, wherein the ultrasonic components of the processing subsystem further comprises a pulser/receiver and a digital to analog converter.
10. The screening tool of claim 1, wherein the processing subsystem further comprises a handle affixed to a top of the housing.
11. A processing subsystem for detecting whether a predetermined type of liquid is contained in a

container, the processing subsystem comprising: a housing; a processor disposed in the housing, wherein the processor is electrically couplable to a screening tool; an AC/DC converter electrically coupled to the processor; and ultrasonic components electrically coupled to the processor and the AC/DC converter.

12. The processing subsystem of claim 11, further comprising a pair of data ports electrically coupled to the processor, wherein the pair of data ports are configured to enable data downloads.

13. The processing subsystem of claim 11, further comprising at least one front fan grill disposed on a front of the housing, at least one first rear fan grill disposed on a rear of the housing, and at least one battery mount disposed on the rear of the housing.

14. The processing subsystem of claim 13, further comprising at least a first front fan positioned adjacent to the at least one front fan grill, and at least a first rear fan positioned adjacent to the at least one rear fan grill.

15. The processing subsystem of claim 11, wherein the ultrasonic components further comprise a pulser/receiver and a digital to analog converter.

16. A sensor arm subsystem for detecting whether a predetermined type of liquid is contained in a container, the sensor arm subsystem comprising: a case; a handgrip coupled to the case; an arm extending from the case; an ultrasonic sensor attached to a distal end of the arm, wherein the ultrasonic sensor is configured to send and receive ultrasonic pulses, wherein the ultrasonic sensor is electrically couplable to a processing subsystem; a temperature sensor attached to the distal end of the arm; and an operator interface coupled to the case.

17. The sensor arm subsystem of claim 16, wherein the temperature sensor is one of a thermocouple, a thermistor, a resistance temperature detector, and a semiconductor-based sensor.

18. The sensor arm subsystem of claim 16, wherein the operator interface comprises a first indicator, a second indicator, and a button indicator.

19. The sensor arm subsystem of claim 16, wherein the temperature sensor is electrically couplable to a processor of the processing subsystem.

20. The sensor arm subsystem of claim 19, wherein the operator interface is electrically couplable to the process of the processing subsystem.