

of this hardware and the methodology described above assume that the touchpad sensor control circuitry **20** is directly driving the electrodes **12**, **14** of the touchpad **10**. Thus, for a typical 12×16 electrode grid touchpad, there are a total of 28 pins (12+16=28) available from the touchpad sensor control circuitry **20** that are used to drive the electrodes **12**, **14** of the electrode grid.

[0019] The sensitivity or resolution of the CIRQUE® Corporation touchpad is much higher than the 16 by 12 grid of row and column electrodes implies. The resolution is typically on the order of 960 counts per inch, or greater. The exact resolution is determined by the sensitivity of the components, the spacing between the electrodes on the same rows and columns, and other factors that are not material to the present invention.

[0020] Although the CIRQUE® touchpad described above uses a grid of X and Y electrodes and a separate and single sense electrode, the sense electrode can also be the X or Y electrodes by using multiplexing. Either design will enable the present invention to function.

BRIEF SUMMARY OF THE INVENTION

[0021] It is an object of the present invention to provide a fluid level sensing system that utilizes capacitance-sensitive touchpad technology.

[0022] It is another object to provide the fluid level sensing system that is capable of determining the presence or the absence of a fluid in a container.

[0023] It is another object to provide a fluid level sensing system that is capable of determining composition or characteristics of fluid materials stored in a container.

[0024] It is another object to provide the fluid level sensing system that is capable of determining the level of the fluid in the container over the length of a capacitance-sensitive sensing device.

[0025] It is another object to provide the fluid level sensing system that is easily able to conform to a surface of a container.

[0026] It is another object to provide the fluid level sensing system that is able to operate through a non-metallic container.

[0027] It is another object to provide the fluid level sensing system that utilizes mutual capacitance sensing technology.

[0028] It is another object to detect different layers of fluids within a container.

[0029] In a preferred embodiment, the present invention is a capacitance-sensitive sensor array and associated touchpad sensor circuitry, the sensor array comprised of a flexible substrate having a plurality of printed conductor elements disposed thereon to form the sensor array, the printed conductor elements being coupled to touchpad sensor circuitry that includes data processing capabilities, wherein the sensor array is disposed along an outside surface of a container, wherein the sensor array is capable of conforming to a curved or irregular outside surface of the container, wherein the sensor array detects at least one characteristic of at least one fluid disposed within the container, and wherein the touchpad sensor circuitry processes data received from the sensor array to provide information regarding the at least one fluid.

[0030] These and other objects, features, advantages and alternative aspects of the present invention will become

apparent to those skilled in the art from a consideration of the following detailed description taken in combination with the accompanying drawings.

DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0031] FIG. 1 is a block diagram of the components of a capacitance-sensitive touchpad as made by CIRQUE® Corporation.

[0032] FIG. 2 is perspective view of a sensor array disposed on the outside of a container, and used to determine at least one characteristic of a fluid within.

[0033] FIG. 3 is perspective view of a sensor array disposed inside a container, and used to determine at least one characteristic of a fluid within.

[0034] FIG. 4 is a display showing an output that is illustrative of signal strength of various fluids being detected by a capacitance-sensitive sensor array of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0035] Reference will now be made to the drawings in which the various elements of the present invention will be given numerical designations and in which the invention will be discussed so as to enable one skilled in the art to make and use the invention. It is to be understood that the following description is only exemplary of the principles of the present invention, and should not be viewed as narrowing the claims which follow.

[0036] The presently preferred embodiment of the invention is essentially a capacitance-sensitive touchpad that is capable of performing proximity sensing of a fluid or fluids. Accordingly, a more accurate description is to state that the invention utilizes a capacitance-sensitive proximity sensing device that is disposed in a position relative to the container so that the device is capable of determining at least one characteristic of a fluid or fluids disposed within the container.

[0037] FIG. 2 is provided to show a container **30** and a fluid **32** within the container. A sensor array **34** is disposed outside the container **30**, and flush against the container wall. In this configuration, the container **30** must either not interfere with the sensing technology of the invention, or provide an aperture or window into the container that will enable the sensor array **34** to operate. The touchpad sensor circuitry **36** is shown coupled to the sensor array **34** via ribbon cable or length of flexible substrate material **38**.

[0038] It is noted that information from the touchpad sensor circuitry **36** can be transmitted to a computer or other receiving device via wired or wireless means, as known to those skilled in the art.

[0039] Because the proximity sensing device operates on well-established principles of mutual capacitance-sensitive touchpad technology, as described in patents issued and pending of CIRQUE® Corporation, it is observed that the container **30** must be comprised of a non-metallic material in order to not interfere with the capacitance-sensitive proximity sensing device if the sensor array **34** is sensing through a wall of the container. In other words, any material that would interfere with the operation of a capacitance sensitive touchpad cannot be used for the container **30**, unless a non-interfering aperture is provided. However, a