THE PATENTS ACT, 1970
(39 of 1970)
AND
THE PATENTS RULES, 2003

COMPLETE
SPECIFICATION

(See Section 10; rule 13)

TITLE OF THE INVENTION

"PRODUCT DISPENSING SYSTEM WITH PWM CONTROLLED
SOLENOID PUMP"

APPLICANT

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The following specification particularly describes
the invention and the manner in which
it is to be performed

What is claimed is:

1. A system for monitoring flow conditions of fluid flowing from a product container
through a solenoid pump comprising:

at least one solenoid pump comprising a solenoid coil, which, when energized,
produces a stroke of the solenoid pump;

at least one product container connected to the at least one solenoid pump wherein
the at least one solenoid pump pumps fluid from the at least one product container during
each stroke;

at least one PWM controller configured to energize the at least one solenoid pump;

at least one current sensor for sensing the current flow through the solenoid coil and
producing an output of the sensed current flow; and

a control logic subsystem for controlling the flow of fluids through the solenoid
pump by commanding the PWM controller and for monitoring the current through the
solenoid pump by receiving the output from the current sensor, wherein the control logic
subsystem uses the measured current flow through the solenoid coil to determine whether
the stroke of the solenoid pump is functional.

2. The system of claim 1 wherein the control logic subsystem uses at least the measured
current flow through the solenoid coil to determine a Sold-Out condition of the at least one
product container.

3. The system of claim 1 wherein the control logic subsystem uses the measured current
flow through the solenoid coil to determine whether the stroke of the solenoid pump is non-
functional.

4. The system of claim 3 wherein the control logic subsystem uses the measured current flow through the solenoid coil to determine whether the stroke of the solenoid pump is a Sold-Out Stroke.

5. The system of claim 4 further comprising wherein the control logic subsystem determines a Sold-Out condition of the at least one product container if a threshold number of consecutive Sold-Out Strokes is reached.

6. The system of claim 5 wherein the at least one product container further comprising an RFID tag that stores a fuel gauge value representing the amount of fluid remaining in the at least one product container.

7. The system of claim 6 wherein the control logic subsystem determines a Sold-Out condition of the at least one product container if a given number of consecutive Sold-Out Strokes are determined and the fuel gauge is above a threshold volume.

8. A method for monitoring flow of fluid from a product container through a solenoid pump comprising:

   energizing a solenoid coil of the solenoid pump to produce a stroke of the solenoid pump;

   pumping fluid from a product container through the solenoid pump during each stroke;

   sensing the current flow through the solenoid using a current sensor and producing an output of sensed current flow;

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monitoring the current through the solenoid pump using a control logic subsystem, the control logic subsystem receiving the sensed current flow from the current sensor; and

determining whether the stroke of the solenoid pump is functional.

9. The method of claim 8 further comprising the control logic subsystem determining a Sold-Out condition of the at least one product container using at least the measured current flow through the solenoid coil.

10. The method of claim 8 further comprising the control logic subsystem determining whether the stroke of the solenoid pump is non-functional using the measured current flow through the solenoid coil.

11. The method of claim 10 further comprising the control logic subsystem determining whether the stroke of the solenoid pump a Sold-Out Stroke using the measured current flow through the solenoid coil.

12. The system of claim 11 further comprising wherein the control logic subsystem determining a Sold-Out condition of the at least one product container if a threshold number of consecutive Sold-Out Strokes is reached.

13. The method of claim 12 further comprising determining the amount of fluid remaining in the product container using an RFID tag that stores a fuel gauge value representing the amount of fluid remaining in the at least one product container.

14.   The method of claim 13 further comprising the control logic subsystem determining a Sold-Out condition of the product container if a given number of consecutive Sold-Out Strokes are determined and the fuel gauge is above a threshold volume.

15.   A system for determining a Sold-Out condition of a product container comprising:

at least one solenoid pump comprising a solenoid coil, which, when energized, produces a stroke of the pump;

at least one product container connected to the at least one solenoid pump wherein the at least one solenoid pump pumps fluid from the at least one product container during each stroke;

at least one PWM controller configured to energize the at least one solenoid pump and control the voltage applied to the at least one solenoid pump;

at least one current sensor for sensing the current flow through the solenoid coil and producing an output of the sensed current flow; and

a control logic subsystem for controlling the flow of fluids through the solenoid pump by commanding the PWM controller and for monitoring the current through the pump by receiving the output from the current sensor, wherein the control logic subsystem uses at least the measured current flow through the solenoid coil to determine a Sold-Out condition of the at least one product container.

16.   The system of claim 15 wherein the control logic subsystem determines if the at least one solenoid pump stroke was a functional stroke based on the output of the current sensor.

17.   The system of claim 16 wherein the control logic subsystem determines if the at least one solenoid pump stroke was a Sold-Out Stroke based on the output of the current sensor.

18. The system of claim 17 further comprising wherein the control logic subsystem determines a Sold-Out condition of the at least one product container if a threshold number of consecutive Sold-Out Strokes is reached.

19. The system of claim 18 wherein the control logic subsystem determines if the at least one solenoid pump stroke was a non-functional stroke based on the output of the current sensor.

20. The system of claim 19 wherein the at least one product container further comprising an RFID tag that stores a fuel gauge value representing the amount of fluid remaining in the at least one product container.

21. The system of claim 20 wherein the control logic subsystem determines a Sold-Out condition of the system if a given number of consecutive Sold-Out strokes are determined and the fuel gauge is above a threshold volume.

22. The system of claim 15 wherein the control logic subsystem varies a high frequency duty cycle of the PWM controller to control the current measured by the current sensor.

23. The system of claim 15 further comprising at least one power supply connected to the at least one solenoid pump via the at least one PWM controller and the at least one current sensor.

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