SYSTEM AND METHOD FOR DISCRIMINATING A ROLL IN A PAPER ROLL DISPENSE, AND A PAPER ROLL

Inventors: Alain Lemaire, Kingsey Falls (CA); Laurent Lemaire, Warwick (CA); Francois Ruel, Victoriaville (CA); Marcel Dion, Kingsey Falls (CA); Yves Martin, Kingsey Falls (CA)

Correspondence Address:
MERCHANT & GOU LD PC
P.O. BOX 2903
MINNEAPOLIS, MN 55402-0903 (US)

Assignee: CASCADES CANADA INC., Montreal (CA)

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ABSTRACT
A system and a method discriminates a roll placed in a paper roll dispenser, as well as a paper roll with a core having at least one passive electrically conductive element, to be used in conjunction with the dispenser. The system includes a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll. The system also includes an application for applying an input signal to the probe, a detector for detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe, and a discriminator for discriminating the paper roll based on a value of the output signal detected by the detector.
FIG. 7
SYSTEM AND METHOD FOR DISCRIMINATING A ROLL IN A PAPER ROLL DISPENSE, AND A PAPER ROLL

FIELD OF THE INVENTION

[0001] The present invention generally relates to paper roll dispensers, for example for paper towels or toilet paper. More precisely, the invention relates to a system and a method for discriminating a roll in a paper roll dispenser.

BACKGROUND OF THE INVENTION

[0002] Several types of paper roll dispensers exist in the prior art. These systems provide gradually to a user of the dispenser different types of paper rolled around an inner core (hereinafter referred to as a “paper roll”). The most common of these dispensers dispense paper items such as paper towels and toilet paper. These dispensers are often used in public area washrooms.

[0003] An example of such a dispenser can be found in U.S. Pat. No. 6,293,486 (BYRD et al.). This document describes a dispenser comprising an electronic system, which includes a network of at least one photovoltaic cell which feeds a control circuit, which, in turn, controls overall operation of the dispenser. The control circuit detects to a detection device, which detects variations in light. The detection of a variation in the light activates the distribution of a certain quantity of paper towels when an object, such as the hand of a user, passes in front of the detection device.

[0004] U.S. Pat. No. 6,412,679 (FORMON et al.) is also known in the art and teaches a motorised dispenser which can distributed individual paper towel segments from a paper roll. The dispenser comprises a control device capable of detecting the presence of a user, which activates the paper feeding device. The control device is also used to control the amount of paper dispensed by preventing distribution of paper if a certain portion of paper did not detach itself properly from the roll.

[0005] US patent application no. 2002/0096028 (MORAND) is also known in the art and describes a paper towel distribution apparatus comprising a paper roll support for the paper towels and a cutting device pivotally mounted on an external peripheral part of the paper roll. The cutting device can be placed between an initial position where the sharp side of the cutting device is positioned in proximity of the external peripheral part, and a second position where the sharp side of the cutting device is moved away from the paper roll support. In this second position, the sharp side of the cutting device is positioned in a direction generally opposite with respect to the paper roll support rotational direction, such that any pulling force exerted by a user on the paper towel distribution system will act against the sharp side of the cutting device, thereby cutting a segment of paper towel from the roll.

[0006] European patent application EP 1 232 715 discloses a paper towel dispenser which has a capacitance-change-based proximity sensor. The proximity detector senses when a hand is placed near the dispenser, and thereupon dispenses a set amount of towel. The proximity sensor comprises a circuit according to a balanced bridge principle wherein detection is based on detecting a phase difference, which depends upon the amount of detected capacitance difference or change.

[0007] Other systems in the prior art relate to paper roll anti-theft protection devices. U.S. Pat. No. 6,653,940 teaches a method and system for preventing the unauthorized removal of paper rolls, such as cash register receipt paper rolls used by retailers, as well as the anti-theft paper roll and methods of preparation therefor. The method comprises affixing to the paper roll an electronic sensor, wherein the sensor emits a detectable signal and detecting the presence of the sensor when it passes through or near a detection point at the retailer’s location. In one embodiment of the invention, the sensor is an adhesive strip, affixed to the core of the paper roll, wherein the core of the paper roll comprises a flat surface integrally formed therein, onto which the sensor is affixed.


[0009] As shown above, certain prior art dispensers allow a distribution of paper towels through light detection systems, motion detectors and/or capacitance-change-based proximity sensors capable of detecting the presence of a user near the dispenser.

[0010] However, it would be advantageous for several different reasons, notably for reasons of quality control and a reduction of maintenance and repair costs for dispensers, to develop a paper roll dispenser which can only operate with paper rolls specifically tailored for use in the dispenser. Thus, there is presently a need for a type of dispenser which can reduce the occurrences of damages caused to the dispenser through installation of an improper roll in the dispenser.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide a system and a method for discriminating a roll in a paper roll dispenser.

[0012] According to the present invention, there is provided a system for discriminating a roll placed in a paper roll dispenser, comprising:

[0013] a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll;

[0014] means for applying an input signal to the probe;

[0015] means for detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe; and
[0016] means for discriminating the paper roll based on a value of the output signal detected by the means for detecting.

[0017] According to the present invention, there is also provided a method for discriminating a roll placed in a paper roll dispenser comprising the steps of:

a) placing the roll in the dispenser;

b) providing a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll;

c) applying an input signal to the probe;

d) detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe; and

e) discriminating the paper roll based on a value of the output signal.

[0023] The system and method of the present invention can be used with a paper roll comprising a core comprising at least one passive electrically conductive element having an electrical conductivity different from that of the core.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The present invention and its advantages will be more easily understood after reading the following non-restrictive description of preferred embodiments thereof, made with reference to the following drawings in which:

[0025] FIG. 1 is a perspective view of a dispenser which includes a system for discriminating a roll according to a first preferred embodiment of the invention showing the paper roll inserted in the dispenser;

[0026] FIG. 2 is a schematic perspective view of a paper roll according to another preferred embodiment of the present invention;

[0027] FIG. 3 is a partial perspective view of parts of the system according to a first preferred embodiment of the present invention, in relation with parts of the dispenser;

[0028] FIG. 4 is a side view of what is shown in FIG. 3;

[0029] FIG. 5 is a front view of what is shown in FIGS. 3 and 4;

[0030] FIG. 6 is a perspective view of the probe components of the system according to a first preferred embodiment of the present invention;

[0031] FIG. 7 is a schematic block diagram showing components of the system according to a first preferred embodiment of the present invention;

[0032] FIG. 8 is a schematic representation illustrating the relation between the plates according to a first preferred embodiment of the present invention and a paper roll;

[0033] FIG. 9 is a schematic representation illustrating the relation between the plates according to a first preferred embodiment of the present invention and a paper roll;

[0034] FIG. 10 is a graph illustrating voltages applied to the conducting elements in relation with different paper rolls, versus time;

[0035] FIG. 11 is a schematic block diagram showing components of the system according to a second preferred embodiment of the present invention;

[0036] FIGS. 12a to 12e are schematic perspective views of paper rolls according to three preferred embodiments of the present invention with one, two and three electrically conductive elements in each roll, respectively; and

[0037] FIG. 13 is a schematic partial perspective view of the roll support structure used in a system according to another preferred embodiment of the present invention and illustrated schematically in FIG. 11.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0038] As aforesaid and shown in FIGS. 1, 7, 11 and 13, it is an object of the present invention to provide a system and a method for discriminating a roll 12 in a paper roll dispenser 14. The system for discriminating a roll 12 placed in a paper roll dispenser 14 comprises a probe 16 sensitive to a presence of an electrically conductive element in proximity thereof, the probe 16 being located within the paper roll dispenser 14 such that when the roll 12 is positioned within the dispenser 14, the probe 16 is in proximity of the roll 12. The system also comprises means for applying an input signal 17 to the probe 16 and means for detecting 18 an output signal from the probe 16, the output signal being indicative of a presence of the electrically conductive element proximate the probe 16. The system also comprises means for discriminating 19 the paper roll 12 based on a value of the output signal detected by the means for detecting 18.

[0039] As shown in FIGS. 1 and 7, according to a first preferred embodiment of the present invention, the system for discriminating a roll 12 placed in a paper roll dispenser 14 comprises at least two conducting plates 20 located within the paper roll dispenser 14 such that when the roll 12 is positioned within the dispenser 14, the plates 20 are in proximity of the roll 12. The plates 20 are electrically insulated from each other. In this embodiment, the means for detecting is a means for detecting capacitance between the plates, the output signal being representative of the capacitance being detected. The plates 20 are in proximity of the roll 12 in that if the roll comprises an element having an electrical conductivity from that of the paper roll core, the capacitance measured between the plates 20 is affected.

[0040] Preferably, as shown in FIGS. 3 to 6, the at least two, and preferably four, conducting plates 20 are shaped and positioned in an annular fashion in proximity of a roll support structure 22 within the dispenser 14.

[0041] Preferably, the means for detecting 18 detects capacitance between an individual pair of adjacent plates 20 in a sequenced manner one pair after another such that all combinations of capacitance between adjacent conducting plates 20 are detected.

[0042] In accordance with the first preferred embodiment and as shown in FIG. 7, the for applying the input signal comprises means for applying voltage between two adjacent
plates 20. Preferably, the means for applying voltage is included in an oscillator 26 operating at 4 KHz. The means for detecting the output signal is a voltage detector between two adjacent plates 20. Preferably, the voltage detector is included in a microprocessor 28 operating at 1 MHz. The system also comprises a controller for controlling the means for applying and the voltage detector, in order to scan each pair of plates 20 by sequentially applying the voltage between the plates 20 of the pair during a given time period, and either summing the charge or discharge rate of voltage between the plates 20 of the pair, said charge or discharge rate being indicative of the capacitance. Preferably, the controller is included in a microprocessor 28.

[0043] Preferably, the means for discriminating the paper roll comprises comparing means which compares the signal resulting from the charge and the discharge of the conducting plates to a reference signal. Preferably, the comparing means is included in a microprocessor 28 as shown in FIG. 7.

[0044] Preferably, the system according to the present invention further comprises means for compensating the signal resulting from the charge and the discharge of the conducting plates for changes in an environment surrounding the system. In this manner, the means for detecting generates a capacitance signal associated with each of the combinations of capacitance between adjacent conducting plates. The means for compensating selects one of the detected capacitance signals and associates the selected one of the detected capacitance signals with an environmental signal indicative of environmental conditions surrounding the system. Since there is typically one more plate than the number of electrically conductive elements in the roll, one of the capacitance measurements between a pair of plates will not be affected by the presence of an electrically conductive element and will thus measure environmental conditions only. The other capacitance measurements will be affected both by the presence of an electrically conductive element and environmental conditions. Consequently, the means for compensating subtracts the environmental signal from the remaining capacitance signals for compensating the resulting output signal for changes in the environmental conditions surrounding the system. Preferably, the means for compensating is included in a microprocessor 28 as shown in FIG. 7.

[0045] As shown in FIGS. 11 and 13, according to a second preferred embodiment of the present invention, the probe 16 comprises a roll support structure 74 and an antenna 70 moulded on the roll support structure 14. The means for applying 17 is for applying an electromagnetic wave on the antenna 70, the output signal being representative of a rate of stationary waves at the antenna 70.

[0046] Preferably, the means for applying 17 applies on the antenna electromagnetic waves having a frequency between 590 MHz and 2.36 GHz.

[0047] Preferably, the system according to the present invention further comprises means for detecting a placement of the roll in the system. Preferably, the means for detecting are detection switches 30a and 30b as shown in FIG. 7.

[0048] Preferably, the system according to the present invention further comprises means for informing a user of results of an assessment made by the means for discriminating. Preferably, the means for informing the user is a display comprising a green light 32a and a red light 32b, either one being activated depending on the results of the assessment made by the means for discriminating, as shown in FIG. 7.

[0049] Preferably, the system according to the present invention further comprises means for converting the output signal into a continuous voltage. Preferably, in the first preferred embodiment of the present invention, the means for converting is located between the means for applying the voltage and the voltage detector, such as between the oscillator 26 and microprocessor 28 shown in FIG. 7. Preferably, the system further comprises at least one battery 34 to provide power to the system, a paper level switch 36 to indicate to the system the amount of paper left on the roll 12, and a printed circuit board 38 as shown in FIGS. 3 to 6.

[0050] As aforesaid and shown in FIG. 2, the present invention can be used with a paper roll 12 which can be discriminated.

[0051] As shown in FIG. 2 and according to the present invention, the paper roll 12 comprises a core 50 comprising at least one passive electrically conductive element 52 having an electrical conductivity different from that of the core 50.

[0052] Preferably, the core 50 has a hollow cylindrical shape and comprises at least two strips of material, preferably cardboard helicoidally rolled around a central axis.

[0053] Preferably, the at least one passive electrically conductive element 52 is placed at an interface between the at least two strips of material. Because the strips are helicoidally rolled, the at least one passive element 52 will also have a corresponding spiral shape.

[0054] In another preferred embodiment and as shown in FIGS. 12a to 12c, the core 50 can comprise more than one passive element 52. Preferably, the passive elements 52 are placed symmetrically around the central axis of the roll 12 such that, at any point along the central axis of the roll 12, there is an equal angular distance with respect to the central axis between passive elements 52 along a circumference of the roll 12 (e.g. 120 degrees between 3 elements, 180 degrees between two elements).

[0055] Preferably, according to the first preferred embodiment of the present invention, the system comprises one additional conductive plate 20 compared to the number of passive elements 52 in the core 50 of the roll 12 to be discriminated. For example, if the core 50 comprises three passive elements 52, the system should comprise four conductive plates 20. Consequently, given the symmetry in the placement of the passive elements 52, detection of a change in the capacitance between the plates will occur between three pairs of plates out of the possible four pairs of plates. By having more than one passive element in the paper roll core, it is possible to further characterize the roll in question.

[0056] Preferably, the at least one passive electrically conductive element 52 is a copper wire and is 36 AWG in size. This material and size are chosen for manufacturing considerations, since this type of wire is easily cut by the saw which also cuts the strips that eventually form the core.

[0057] According to the first preferred embodiment of the present invention, the basic principle behind the detection of
the passive element 52 in the core 50 is the measurement of a change in capacitance. In this case, the change in capacitance between a core having a passive element and a core not having a passive element is of the order of a range between 0.2 and 0.4 pF and preferably about 0.3 pF. Preferably, the detection system comprises four conducting plates 20 shaped and positioned in an annular fashion in proximity of a roll support structure 22 within the dispenser 14. When the means for detecting a placement of the roll in the system 30a and 30b is activated after an actual placement of a roll in the system, the system is activated and measurements of capacitance between adjacent conducting plates 20 are taken. The conductivity of the passive element 52 in the core will have an effect of modifying the frequency of the oscillator 26 connected to the different plates 20a, 20b, 20c, and 20d as shown in FIG. 7. One after the other, the microprocessor 28 will connect the oscillator 26 with the different plates 20a, 20b, 20c, and 20d and will store in its memory the obtained frequency. As mentioned previously, the system preferably comprises one additional conductive plate 20 compared to the number of passive elements 52 in the core 50 of the roll 12 to be discriminated. Consequently, given the symmetry in the placement of the passive elements 52, detection of a change in the capacitance between the plates will occur, for example, between three pairs of plates out of the possible four pairs of plates. Hence, three out of the four measurements will store a frequency associated with a passive element and the environment, while the fourth measurement will store a frequency associated with the environment only. This environment frequency can be subtracted from the three other total frequency measurements and will thus automatically compensate for any changes in the environment of the system. In this manner, the microprocessor 28 is able to clearly identify the model of the paper roll product inserted into the dispenser 14. If the inserted paper roll 12 corresponds to the desired model or type of product, a green light 32a will be activated to indicate the validity of the product. Otherwise, a red light 32b will be activated to indicate that the inserted paper roll does not correspond to the desired model.

The measurement of the change of capacitance is based on the principle of accumulation of energy between two conductive surfaces separated by an insulating material. When voltage is applied to two plates 20, electrical charges are blocked by the insulating material between the plates 20 and accumulate, thereby creating a voltage difference.

As shown in FIG. 8, the more the insulating material has better insulating properties, the less charges can be transferred from one plate 20a to another plate 20b and passage of charges 60 between the plates individually connected to the oscillator 26 is hindered. Consequently, a voltage difference between the plates 20 can increase more rapidly since there is no loss of charges 60 between the plates 20 which are inserted around the plastic roll support structure 22.

As shown in FIG. 9, by inserting a passive element 52 having an electrical conductivity different from that of the paper roll core 50 in FIG. 8, the insulating properties of the insulating material between the two conductive plates 20 is affected. In a preferred embodiment of the present invention, this passive element 52 is a copper wire. Hence, when a conductive material like the copper wire is in proximity of the two plates, the passive element 52 creates a path facilitating the passage of charges 60 from one plate to the other. This has the result of reducing the insulating properties of the material between the plates and therefore facilitates the passage of electrons. Consequently, the voltage difference developed between the plates increases more slowly, in a situation analogous to attempting to fill a bucket with water compared to attempting to fill a bucket with water when there is a hole in the bucket.

According to a preferred embodiment of the present invention, the system comprises an oscillator 26 which applies a voltage to the conducting plates 20. The plates will be charged in a manner dependent on the quality of the insulating material which will be affected by the presence or not of the passive element 52 in the paper roll core 50. As shown in FIG. 10, when the voltage difference between the plates reaches a particular target level 64, the oscillator 26 reverses itself and discharges the energy accumulated between the plates 20. The better the insulating properties of the material 66, the more rapidly the target voltage level 64 is reached, and therefore the oscillatory action of the oscillator is quicker. When the passive element 52 is present 68, the loss of charges from one plate to the other is greater, hence the time required for charging the plates and reaching the target level voltage difference is increased, resulting in a lower frequency. In FIG. 10, the target voltage level 64 is set to 100% of the voltage supplied to the system. In a preferred embodiment of the present invention, in order to reduce power consumption by the system, the target voltage level is set at a lower percentage of the voltage supplied to the system, e.g. 50%.

Preferably, an electronic component is inserted between the oscillator 26 and the microprocessor 28 to convert the frequency into a constant voltage. The level of this voltage is a function of the frequency. If the frequency increases, the voltage will increase accordingly. Preferably, the electronic component comprises a low-pass filter having a cutoff frequency at 16 Hz.

In the second preferred embodiment of the present invention, the detection device uses another technology for detection of the conductive element inserted into the manufacturing of the roll: radio-frequency. The important sensitive element is in fact an antenna, which is inherently unbalanced for the frequency of the signal that is applied thereupon and on which an electromagnetic wave is sent. The calculation of the frequency to be used in this system is based on the length required to propagate a full wave, according to the following relationship: \( L = \frac{500}{F} \), where \( L \) is the length of the conductor in meters and \( F \) is the frequency in MHz. For example, a frequency of about 1.18 GHz is used for approximately 10 inches of conductive metallic elements, for an 8 inch roll. Similarly, a frequency of about 2.36 GHz is used for approximately 5 inches of conductive metallic elements, for a 4 inch roll. The lengths of rolls for the dispensing machines typically range between 4 inches and 16 inches, thus requiring approximately between 5 inches and 20 inches of metallic conductive elements. Consequently, corresponding frequency ranges will be between 590 MHz and 2.36 GHz. As shown in FIG. 13, the first section of the antenna 70 is moulded upon the roll support structure 74. As shown in FIG. 11, when the means for detecting replacement of a roll in the system 130a and 130b is activated after a replacement of a roll 14 in the system, the system is activated and an electromagnetic wave
is applied on the antenna 70, and a measurement of the rate of stationary waves is taken. The presence of a metallic conductive element proximate a first section of the antenna completes the antenna and balances the antenna system. A balanced antenna will completely transmit a wave and the rate of stationary waves will be minimal. An unbalanced antenna will reflect waves and the rate of stationary waves will thus increase. The balancing of the antenna is directly linked to the length of conductive material inserted into the roll.

[0064] As shown in FIG. 11, the microprocessor 128 will activate the emitter 110 and measure the rate of stationary waves and can thus clearly identify the model or type of product installed into the dispenser.

[0065] Once again, if the inserted paper roll 12 corresponds to the desired model or type of product, a green light 132a will be activated to indicate the validity of the product. Otherwise, a red light 132b will be activated to indicate that the inserted paper roll does not correspond to the desired model.

[0066] Preferably, upon identification of an incorrect paper roll inserted into the distributor, certain models can then activate a motor to release the support structure for the roll thus making it impossible to maintain a roll in place in the dispenser. The roll support structure can then return to its standard position once the incorrect roll has fallen from the dispenser.

[0067] Hence one element of novelty of the invention as claimed resides in the insertion in the core 50 of the paper roll 12 of a passive electrically conductive element 52 having an electrical conductivity different from that of the cardboard used during manufacturing of the core 50. This passive element 52 constitutes a distinctive feature which allows its detection and identification of the model of the paper roll.

[0068] When the paper roll 12 is inserted in the dispenser 14, the system according to the present invention validates the number of distinctive elements present in the core 50 of the paper roll 12 and can then activate or not a locking system for the paper roll 12.

[0069] When the model of the paper roll 12 is considered to be valid, the system will transition to an energy-saving mode, and no other apparent event will occur except for the activation during a short amount of time of the green light 32a to indicate the validity of the paper roll 12.

[0070] Otherwise, the system can command means 40 so that the dispenser cannot be used. During this operation, a red light 32b will indicate during a short amount of time the non-conformity of the paper roll 12.

[0071] In either case, whatever the type of paper roll 12 inserted in the dispenser 14, the system will be activated and detect the nature of the paper roll 12 upon sensing the insertion of a paper roll 12 on the roll support structure 22 in the dispenser 14.

[0072] As disclosed hereinabove in the Summary of the Invention, it is also an element of the present invention to provide a method for discriminating a roll in a paper roll dispenser, involving five basic steps to which may be added a plurality of optional steps.

[0073] The method for discriminating a roll in a paper roll dispenser is preferably carried out using the following sequence of steps:

[0074] a) placing the roll in the dispenser;

[0075] b) providing a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll;

[0076] c) applying an input signal to the probe;

[0077] d) detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe; and

[0078] e) discriminating said paper roll based on a value of the output signal.

[0079] Preferably, the method further comprises the steps of:

[0080] detecting a placement of the roll in the system after step a) and before step c); and

[0081] initiating step c) upon detection of the placement of the roll in the system.

[0082] In accordance with a first preferred embodiment of the method of the present invention, the method for discriminating a roll in a paper roll dispenser is also carried out using the following more detailed sequence of steps, wherein:

[0083] step b) comprises the step of providing at least two conducting plates shaped and positioned in an annular fashion in proximity of a roll support structure within the dispenser;

[0084] step c) comprises the step of applying voltage between two adjacent plates of said plates; and

[0085] step d) comprises the steps of:

[0086] measuring voltage between two adjacent plates of said plates;

[0087] scanning each pair of said plates by sequentially applying the voltage between the plates of the pair during a given time period, and either measuring the charge or discharge rate of voltage between the plates of the pair to produce a measured capacitance signal for each pair;

[0088] associating one of the measured capacitance signals with an environmental signal indicative of environmental conditions surrounding the dispenser; and

[0089] subtracting the environmental signal from each of the remaining measured capacitance signals to produce the output signal,

[0090] and

[0091] step e) comprises the steps of:

[0092] comparing the output signal to a reference signal to obtain an assessment of the output signal;
[0093] converting said assessment signal into a continuous voltage; and

[0094] informing a user of results based on the continuous voltage.

[0095] Alternately, in accordance with a second preferred embodiment of the method of the present invention, the method for discriminating a roll in a paper roll dispenser is also carried out using the following more detailed sequence of steps, wherein:

[0096] step b) comprises the step of providing a roll support structure and an antenna moulded on the roll support structure;

[0097] step c) comprises the step of applying an electromagnetic wave on the antenna;

[0098] step d) comprises the steps of measuring a rate of stationary waves at the antenna;

[0099] and

[0100] step e) comprises the steps of

[0101] comparing the output signal to a reference signal to obtain an assessment of the output signal;

[0102] converting said assessment signal into a continuous voltage; and

[0103] informing a user of results based on the continuous voltage.

[0104] Although the present invention has been explained hereinabove by way of preferred embodiments thereof, it should be pointed out that any modifications to these preferred embodiments within the scope of the appended claims is not deemed to alter or change the nature and scope of the present invention.

1. A system for discriminating a roll placed in a paper roll dispenser, comprising:

a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll;

means for applying an input signal to the probe;

means for detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe; and

means for discriminating said paper roll based on a value of the output signal detected by the means for detecting.

2. The system of claim 1, wherein the probe comprises at least two conducting plates electrically insulated from each other, and the means for detecting is a means for detecting capacitance between the plates, the output signal being representative of the capacitance that is detected.

3. The system of claim 2, wherein the at least two conducting plates are shaped and positioned in an annular fashion in proximity of a roll support structure within the dispenser.

4. The system of claim 3, wherein the means for detecting detects the capacitance between an individual pair of adjacent plates of said plates in a sequenced manner one pair after another such that all combinations of capacitance between adjacent conducting plates are detected.

5. The system of claim 4, wherein the means for applying the input signal comprises means for applying voltage between two adjacent plates of said plates, the means for detecting the output signal is a voltage detector between two adjacent plates of said plates, and the system further comprises a controller for controlling said means for applying and the voltage detector to scan each pair of said plates by sequentially applying the voltage between the plates of the pair during a given time period, and either measuring the charge or discharge rate of voltage between the plates of the pair to produce said output signal.

6. The system of claim 5, wherein the means for applying voltage is an oscillator.

7. The system of claim 6, wherein the voltage detector is integrated in a microprocessor.

8. The system of claim 7, wherein the controller is integrated in the microprocessor.

9. The system of claim 6, wherein the means for discriminating said paper roll comprises comparing means which compares the value of said output signal to a reference signal.

10. The system of claim 9, wherein the comparing means is integrated in the microprocessor.

11. The system of claim 10, wherein the means for detecting detects that a capacitance change in the range of 0.2 pF to 0.4 pF determines whether the roll is discriminated or not.

12. The system of claim 1, wherein the probe comprises a roll support structure and an antenna moulded on the roll support structure, and the means for applying is for applying an electromagnetic wave on the antenna, the output signal being representative of a rate of stationary waves at the antenna.

13. The system of claim 12, wherein the means for applying applies electromagnetic waves having a frequency between 590 MHz and 2.36 GHz.

14. The system of claim 1, comprising a detector for detecting a placement of the roll in the system.

15. The system of claim 1, comprising means for informing a user of results of an assessment made by the means for discriminating.

16. The system of claim 15, wherein the means for informing the user is a display comprising a green light and a red light, either one being activated depending on the results of the assessment made by the means for discriminating.

17. The system of claim 1, further comprising a converter for converting the output signal into a continuous voltage.

18. A method for discriminating a roll placed in a paper roll dispenser comprising the steps of:

a) placing the roll in the dispenser;

b) providing a probe sensitive to a presence of an electrically conductive element in proximity thereof, the probe being located within the paper roll dispenser such that when the roll is positioned within the dispenser, the probe is in proximity of the roll;

c) applying an input signal to the probe;

d) detecting an output signal from the probe, the output signal being indicative of a presence of the electrically conductive element proximate the probe; and
c) discriminating said paper roll based on a value of the output signal.

19. The method of claim 18 further comprising the steps of:

- detecting a placement of the roll in the system after step a) and before step c); and
- initiating step c) upon detection of the placement of the roll in the system.

20. The method of claim 19, wherein:

- step b) comprises the step of providing at least two conducting plates shaped and positioned in an annular fashion in proximity of a roll support structure within the dispenser;
- step c) comprises the step of applying voltage between two adjacent plates of said plates; and
- step d) comprises the steps of:
  - measuring voltage between two adjacent plates of said plates;
  - scanning each pair of said plates by sequentially applying the voltage between the plates of the pair during a given time period, and either measuring the charge or discharge rate of voltage between the plates of the pair to produce a measured capacitance signal for each pair;
  - associating one of the measured capacitance signals with an environmental signal indicative of environmental conditions surrounding the dispenser; and
  - subtracting the environmental signal from each of the remaining measured capacitance signals to produce the output signal,

and

- step e) comprises the steps of:
  - comparing the output signal to a reference signal to obtain an assessment of the output signal;
  - converting said assessment signal into a continuous voltage; and
  - informing a user of results based on the continuous voltage.

21. The method of claim 19, wherein:

- step b) comprises the step of providing a roll support structure and an antenna moulded on the roll support structure;
- step c) comprises the step of applying an electromagnetic wave on the antenna;
- step d) comprises the steps of measuring a rate of stationary waves at the antenna;

and

- step e) comprises the steps of:
  - comparing the output signal to a reference signal to obtain an assessment of the output signal;
  - converting said assessment signal into a continuous voltage; and
  - informing a user of results based on the continuous voltage.

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