AUTOMATIC MULTI-ROLL TOUCH-LESS TOILET PAPER DISPENSER

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ABSTRACT

The apparatus discloses a multi-roll toilet paper dispenser that automatically dispenses toilet paper. When a person places their hand in proximity of the sensor, the dispenser begins to dispense paper. A finite amount of toilet paper is dispensed allowing the user to tear off the dispensed paper from a roll. After the portion of toilet paper has been removed from the dispenser the dispenser can then dispense subsequent finite amounts of toilet paper. The dispenser allows for dispensing one or more additional rolls of toilet paper after the first roll has been expended. The dispenser can detect the wrapped orientation of each roll and feed accordingly. The presence of the user's hand is detected with an optical or thermal sensor.
FIG. 2
FIG. 3

Logic and Control

Dispense Qty Select

Microcontroller

Hand Detection

Hand Sensor

Paper Detection

Paper Sensor

Roll Change Drive

Arm Power Mechanism

Brake Control

Brake

Drive Motor Control

Drive Motor

Voice Command

Sound Sensor
AUTOMATIC MULTI-ROLL TOUCH-LESS TOILET PAPER DISPENSER

FIELD OF THE INVENTION

[0001] This invention relates to an automatic multi-roll toilet paper dispenser. More particularly, the present invention relates to a toilet paper dispenser that can be filled with more than one roll of toilet paper. The dispenser includes a sensor that detects the presence or movement of a hand under the dispenser to begin dispensing and stops dispensing based upon the position of the hand or when a finite amount of toilet paper has been dispensed. The dispenser further provides for dispensing of at least one subsequent roll when the first roll has been expended.

BACKGROUND OF THE INVENTION

[0002] Most toilet dispensers dispense toilet paper from a single or multiple rolls and the user touches the roll to feed paper into their hand and then rolls the roll to tear off some additional toilet paper. Any germs and or moisture that are present of the user’s hand is transferred to the roll of toilet paper and absorbed into the roll. Any moisture or germs on the roll can then be transferred to the hands of the next person that uses the roll of toilet paper. The potential for transfer of germs provides the foundation for the need to provide a solution to minimize the transfer of germs from one person to another from a toilet paper dispenser.

[0003] U.S. Pat. No. 5,312,021 issued to Nelson on May 17, 1994, U.S. Pat. No. 4,071,200 issued to Stone on Jan. 31, 1978, U.S. Pat. No. 3,450,363 issued to J. L. Williams on Jun. 17, 1969, U.S. Pat. No. 3,317,150 issued to E. J. Summersby on May 2, 1967, U.S. Pat. No. 3,297,269 issued to E. E. Mcgrew on Jan. 10, 1967 and U.S. Pat. No. 3,167,267 issued to M. Rozlog et al on Jan. 26, 1965 all disclose a single roll toilet paper dispensers where a user presses a button to dispense toilet paper. While each of these patents covers an automated dispensing mechanism, the dispensing of the toilet paper requires the user to press and or hold a button for the toilet paper to be dispensed. When a physical buttons is used the potential for cross contamination with other people occurs with the button. The contamination problem has not been removed, but is transferred to a device (button) that was not originally included with the toilet paper dispenser, and further contamination to the button can now be transferred to a larger number of people besides just the next person that will use the toilet paper. These patents further only provide for dispensing a single roll of toilet paper and are not intended for use with toilet paper dispensers having multiple rolls of toilet paper.

[0004] Patent number U.S. Pat. No. 4,721,265 issued to Hawkins on Jan. 26, 1988 discloses a single roll toilet paper dispenser with an optical sensor that detects the presence of the hand of a person to begin dispensing, and continues to dispense as long as the hand is detected. While this patent discloses an automated dispenser where the user does not have to touch the dispenser for the toilet paper to be dispensed, it allows for the complete roll of toilet paper to be dispensed, and does not provide for a limited amount of toilet paper to be dispensed. This patent is also configured for use with only a single roll of toilet paper and does not allow for multiple rolls of toilet paper to be dispensed.

[0005] Published patent application US 2002/019036, published August 15, 2002 to Denen et al. discloses a paper towel dispenser for use with multiple paper towel rolls. This patent is not intended for use with toilet paper rolls, and requires the operator to feed each of the rolls into the dispenser in advance of use of the rolls. The rolls of paper towels must be pre-set into the dispenser in a particular orientation and are fed from feed rollers that pull the paper towels from the rolls.

[0006] What is needed is an automated touch less toilet paper dispenser that can accept multiple rolls of toilet paper and can feed the toilet paper from successive rolls when a roll becomes empty. The proposed automated multi-roll touch-less toilet paper dispenser provides this solution by providing a touch-less toilet paper dispenser that can accept and dispense more than one roll of toilet paper.

BRIEF SUMMARY OF THE INVENTION

[0007] It is an object of the touch-less multi-roll toilet paper dispenser to provide a dispenser that can be operated without requiring the user to touch the dispenser to dispense toilet paper, or require the user to touch the dispenser to remove toilet paper from the dispenser. This feature eliminates the potential for one user to transfer germs to another user because they use their hand to hold the toilet paper roll while they tore-off the desired amount of toilet paper. Hand Transfer of germs, bacteria, and or other harmful human bodily fluids is eliminated when contaminated surfaces are not touched by multiple people.

[0008] It is another object of the touch-less multi-roll toilet paper dispenser to provide a dispenser that can dispense toilet paper from more than one roll of toilet paper. In most restrooms, the high number of people using the restroom requires that more than one roll of toilet paper be provided. If the restroom has only a single dispenser then it is possible that the roll can be left with a minimal amount of toilet paper being left on the roll. The need for a second roll is required to ensure that toilet paper is available.

[0009] It is another object of the touch-less multi-roll toilet paper dispenser to provide a dispenser that can dispense toilet paper from a roll where the roll is placed within the dispenser in either wrapping orientation. This is particularly useful because it allows each roll of toilet paper to be placed into the dispenser in different orientations and still be dispensed without anomaly. The ends of most toilet paper rolls are bound, making the determination of orientation of wrapping difficult. The proposed dispenser can split the sheets of the roll and then unwrap the roll in either orientation of wrapping.

[0010] It is another object of the touch-less multi-roll toilet paper dispenser to provide a dispenser that can dispense a finite amount of toilet paper and also dispense less than a predefined finite amount based upon the action of the user. The dispenser can be pre-set to dispense one to five sheets. The length of each sheet can be pre-entered, estimated or calculated. While a finite number of sheets can be entered the toilet paper dispenser can dispense less than the maximum number of sheets entered based upon the action of the user.

[0011] It is still another object of the touch-less multi-roll toilet paper dispenser to provide a dispenser that can start a standard roll of toilet paper and self-feed to a dispensing opening. This is particularly useful because it allows each roll of toilet paper to be placed into the dispenser in different orientations and still be dispensed without anomaly. The ends of most toilet paper rolls are bound making the determination of orientation of wrapping difficult. The proposed dispenser can split the sheets of the roll and then unwrap the roll in either orientation of wrapping. Full rolls of toilet paper can be
placed within the top of the dispenser, and can be started without requiring the user to orient the rolls or pre-feed the rolls within the apparatus. [0012] Various objects, features, aspects, and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the invention, along with the accompanying drawings in which like numerals represent like components.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 shows an isometric view of a preferred embodiment of the automated multi-roll touch less toilet paper dispenser.

[0014] FIG. 2 shows a side sectional view of the preferred embodiment of the automated multi-roll touch less toilet paper dispenser shown in FIG. 1.

[0015] FIG. 3 shows an electrical block diagram of the dispenser in one contemplated embodiment configuration.

[0016] FIG. 4A-4D shows several views of the roll starting operation in one contemplated configuration of the preferred embodiment.

DETAILED DESCRIPTION

[0017] FIG. 1 shows an isometric view of a preferred embodiment of the automated multi-roll touch less toilet paper dispenser 10. The enclosure of the dispenser is shown in this embodiment with a front housing 20 and a back housing 25. It is contemplated that the housing includes a window or slot so the amount of paper remaining within the dispenser can be determined without opening the dispenser. The housing components are shown here in a clam shell type arrangement but other arrangements of housings are contemplated that allow the toilet paper rolls 30 and 35 to be maintained within the housing. It is further contemplated that the enclosure can house more than the two rolls of toilet paper shown, but only two are being shown for simplicity of the design. A hinge mechanism 22 is shown connecting the two housing parts together. The hinge is shown at the top of the housing, but other orientations with the hinge located at the bottom or sides of the housing are contemplated. A locking device is placed on or within the housing at the side opposite the hinge. The lock keeps the contents of the dispenser secure and reduces the potential for vandalism to the dispenser and the rolls of toilet paper. The end of a roll of toilet paper 32 is shown extending from the inside of the housing. A front looking sensor 80 detects the presence of a hand or hand motion to determine when it will dispense toilet paper from a roll. The operation of the dispensing will be described in more detail when the internal components are described with FIG. 2 and the description of the electronics with FIG. 3. A toilet paper sensor 85 is used to detect the presence of toilet paper that has been dispensed, removed, moved or has not yet exited the dispenser. The operation of the toilet paper detection sensor will be described in more detail when the internal components are described with FIG. 2 and with the description of the electronic with FIG. 3.

[0018] FIG. 2 shows a side sectional view of a preferred embodiment of the automated multi-roll touch less toilet paper dispenser 10 shown in FIG. 1. This FIG. provides a detailed configuration of the internal operation and interaction of the components of a preferred embodiment of the toilet paper dispenser. A front housing 20 and rear housing 25 are shown enclosing the toilet paper rolls and the dispensing mechanism. A hinge 22 allows the two halves of the housing to be pivotally opened and closed. A locking component can also be included to prevent unauthorized access to the inside of the dispenser. A lower toilet paper roll 35 is shown in the dispensing position and an upper toilet paper roll 30 is shown in the storage position. This FIG. shows the toilet paper dispensed in an "over-the-top" 32 and in an "over-the-back" 36 orientation. While both orientations of dispensing are not possible at the same time, this FIG. shows that it is contemplated that both orientations of dispensing the toilet paper are contemplated and can be accommodated by the dispenser. The sensing and drive mechanism that allows for either orientation of dispensing is described in more detail in FIGS. 3 and 4. Two sensors are utilized to detect the presence of a person's hand 80 and to detect the presence, absence or motion 85 of the free end of the toilet paper roll. The logic and control of the dispenser is contained within the dispenser and is described in more detail in FIG. 3.

[0019] A frictional pressure and drive wheel 40 provides driving force on the dispensing roll of toilet paper 35. A spring 54 provides force on arm 50 to maintain pressure on the dispensing roll 35. The spring provides constant force on the dispensing roll to allow the operator to pull on the sheet(s) 32 or 36 that are dispensed to prevent the entire roll from being unwrapped. Idler wheel 60 and braking wheel 45 allows the roll of toilet paper to easily un-spool when it is being driven by drive wheel 40, and also provides a stop to allow the perforated toilet paper to tear away at a point outside of the dispenser. An actuator 52 connected to the control arm is used to maintain pressure on the roll and is also used to lift the arm up and allow the upper roll of toilet paper to fall into the dispensing position.

[0020] A track 70 guides full spare rolls into the dispensing position. When a roll is empty it slides down and rests in area 75 within dispenser housing. This rest area keeps the spent roll out of the dispensing area. It is contemplated that the dispenser can accommodate more than two rolls of toilet paper, and in the contemplated dispenser the rest area will be extended so multiple used rolls will be stored. When a new roll moves into the dispensing position, the orientation of the roll and the threading of the toilet paper in the roll out of the dispenser must be performed to allow use of the new roll. The starting of the roll is shown and described in more detail with FIGS. 4A-4D.

[0021] FIG. 4A-4D shows several views of the roll starting operation in one contemplated configuration of the preferred embodiment. FIGS. 4A and 4C disclose starting a roll where the roll is installed with the toilet paper unwrapping over-the-top 32. FIGS. 4B and 4D disclose starting a roll where the roll is installed with the toilet paper unwrapping over-the-back 36. FIGS. 4A and 4B show the rolls where the sheets separate in front and behind the drive wheel 40. Most rolls of toilet paper have the tail of the toilet paper secured to the inner layer of the roll. The orientation of the wrapping on the toilet paper roll is often difficult to determine until the tail is separated and the roll begins to unwind. Because of this difficulty of determining the orientation of the wrap and the possibility that a roll can be placed in either orientation the dispenser must separate at least two sheets from each other and then thread the free end of the toilet paper out of the dispenser.

[0022] When a new roll 35 falls in the dispensing position the drive wheel is brought into contact with the roll. Pressure 42 is exerted onto the roll from arm 50. Braking wheel 45 is locked. The drive wheel 40 has a frictional surface, that when
turned, pulls two sheets apart, shown as separation 90 in FIG. 4A and separation 91 in FIG. 4B. The turning of the drive wheel is only performed for a short period of time in one direction of rotation and then reversed and turned in the opposite direction of rotation. The turning of the wheel in both directions of rotation is performed to separate a sheet on one or both side of the drive wheel to separate the outer wrapping of the toilet paper from the roll. After the roll starting has taken place the brake on roller 45 is released and the toilet paper roll is turned in first one orientation to detect the presence of the toilet paper 32 with paper sensor 85 (FIG. 2). If no paper is detected the drive wheel 40 will turn the toilet paper roll in the opposite direction and check for the presence of the toilet paper 36 with sensor 85 (FIG. 2). If toilet paper is not detected upon rotating the roll, in either orientation, the dispenser will once again brake roller 45 and try to separate and start the roll. This process will continue until toilet paper begins to dispense and is detected by paper sensor 85 (FIG. 2). It is contemplated that the toilet paper can pass on either side of idler roller 60 that is used to maintain the position of the roll within the dispenser. In another contemplated embodiment the idler wheel is not present since the toilet paper roll can track down slot 70 (FIG. 2) and only engages with the idler roller when the new roll is being started. It is further contemplated that the drive wheel will have sufficient frictional characteristics that it will abreast one or more layers of toilet paper to start the roll. Other contemplated variation of the operation of the dispenser includes using sensors with the drive, braking and/or idler roller to detect the separation of the sheets from the roll when starting a new roll. It is also contemplated that the paper sensor can detect the type or thickness of the paper being dispensed and can vary the amount of paper being dispensed based upon the thickness or quality of the paper.

FIG. 3 shows an electrical block diagram of the dispenser in one contemplated embodiment configuration. The control components are shown in block form to show how the components are connected and interact. The detailed schematic connections of each of the components can be found in a variety of electrical and electronic sources, and are not unique while the application and interaction of these components is unique in operation with a multi-roll automatic touch-less toilet paper dispenser. External power 105 is provided from a source that exists outside of the toilet paper housing and the logic and control circuit. It is contemplated that the housing of the sensor can include solar collection cells and the electrical power from the solar cells can be stored within the toilet paper dispenser to provide operation. The power 105 connects to the logic and control circuit 100. A microcontroller 110 provides reads the sensors and controls motion of the motor and arm. A dispense quantity selection control device 170 allows setting the amount of toilet paper that will be dispensed each time a hand is detected. In the preferred embodiment the control device is dip switches, but other control devices including but not limited to potentiometers, and or push buttons are contemplated that allow setting the default amount of toilet paper from one to some finite number of sheets or length of toilet paper.

When the hand sensor 80 detects the presence of a hand in front of the dispenser, the detection 120 signals the micro-controller. The sensor can be a variety of types including but not limited to optical, thermal or camera. In another contemplated embodiment the sensor detects hand motion and the number of fingers that the user is holding out. The dispenser can then vary the amount of paper that is dispensed based upon the actions of the user. In one contemplated version of this detection, the dispenser can determine that the user is holding out two, three or four fingers, and dispenses accordingly to dispense the amount of toilet paper desired to minimize waste. The paper sensor 85 sends signals to the paper detections circuit 130 that communicates to the microcontroller. In the preferred embodiment the sensor only detects the presence of toilet paper that is hanging out of the dispenser, but it is contemplated that the sensor can detect motion of the toilet paper such as the sheets being torn, or pulled. After sheet(s) have been torn away from the roll, and a hand is detected, drive motor control 160 powers the drive motor/roller 40 to turn and dispense toilet paper. The drive motor can include an encoder to measure the length of paper that is dispensed or can use time to estimate the amount of paper that is dispensed. Once the paper has been dispensed, brake control 150, engages brake 45 to hold the roll in a fixed position to allow the user to tear off the dispensed sheets.

Other contemplated variations of this operation include using sensors to detect the removal of the sheets that have been dispensed. It is also contemplated that the dispenser includes a sound sensor 82 that can detect numeric instructions for the number of sheets to be dispensed. The sound sensor is programmed with commands 122 of with multiple languages to make the dispenser universal and not language dependent. In another contemplated option the microprocessor includes a user adjustable dispensing limiter that provides for limiting the amount of rolled paper product that is dispensed. The limiter prevents dispensing of material beyond the limit regardless of the amount of product requested.

When the paper sensor 85 no longer detects the presence of toilet paper being dispensed out of the dispenser, the microcontroller activates the roll change drive 140, that lifts the arm power mechanism 52 to allow a new roll of toilet paper to fall into the dispense position. The arm will lower onto the new roll and start the new roll as previously described. In one contemplated method of operation, the person servicing the dispenser can simply open the dispenser, remove any spent roll(s), and drop a new roll into the top of the dispenser. Because the dispenser can self feed and start new rolls of toilet paper it is contemplated that the dispenser can be configured to operate with four or more full rolls allowing for less frequent servicing.

Thus, specific embodiments of an automatic touchless multi-roll toilet paper dispenser have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims.

What is claimed is:
1. An automatic multiple roll toilet paper dispenser comprising:
an enclosure for storage and dispensing of rolled paper products;
wherein the dispenser uses sensors detect commands from a user to dispense the rolled product;
at least one roll of product is placed within the dispenser and the dispenser automatically and enter roll out the dispensing opening of the dispenser, and frictional drive wheels that provide for this dispensing of a finite amount of the rolled paper.
2. The automatic multiple roll toilet paper dispenser as defined in claim 1 wherein the dispenser automatically determines the wrapping direction of the multiple rolls placed in the dispenser.

3. The automatic multiple roll toilet paper dispenser as defined in claim 2 wherein the dispenser utilizes a two directional drive motor to unwrap the roll from either side of the roll.

4. The automatic multiple roll toilet paper dispenser as defined in claim 2 wherein the dispenser has frictional rollers to pull apart an outer layer of paper to dispense the remainder of the roll.

5. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes a storage area for empty tubes where the rolled paper product has been dispensed.

6. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes an optical sensor to detect and interpret a hand gesture to dispense variable finite amounts of the roll based upon gesture.

7. The automatic multiple roll toilet paper dispenser as defined in claim 5 wherein the hand gesture includes the number of extended fingers past the sensor.

8. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes an audible sensor to detect and interpret a verbal command to dispense a variable finite amount of the roll based upon the verbal command.

9. The automatic multiple roll toilet paper dispenser as defined in claim 1 that operates with standard toilet paper rolls that do not require separating and threading of the roll in the dispenser.

10. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further allows for multiple rolls of rolled paper products to be stored and loaded for dispensing.

11. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes a storage area for empty tubes where the rolled paper product has been dispensed.

12. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes a roll changing arm that moves to drop an unused rolled paper product into the dispenser.

13. The automatic multiple roll toilet paper dispenser as defined in claim 5 that further includes a roll changing arm that provides for limiting the amount of rolled paper product that is dispensed regardless of the hand gesture.

14. The automatic multiple roll toilet paper dispenser as defined in claim 8 that further includes an adjustable dispensing limiter that provides for limiting the amount of rolled paper product that is dispensed regardless of the verbal command.

15. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes a window or slot to allow for the detection of the amount of undispensed rolled paper products remain within the dispenser without the need to open the dispenser.

16. The automatic multiple roll toilet paper dispenser as defined in claim 1 wherein the dispenser dispenses both perforated and non-perforated rolled paper products.

17. The automatic multiple roll toilet paper dispenser as defined in claim 13 wherein the dispenser varies the maximum of paper that is dispensed with each command based upon the thickness or quality of the paper being dispensed.

18. The automatic multiple roll toilet paper dispenser as defined in claim 1 that further includes a breaking mechanism to limit the ability of the user from pulling additional rolled material from the dispenser.

19. The automatic multiple roll toilet paper dispenser as defined in claim 2 wherein the automatic determining is by utilizing a frictional rollers that pull on the sides of the roll to separate the outer layer of rolled material and then turns the rolled paper product to detect separation of the outer layer.

20. The automatic multiple roll toilet paper dispenser as defined in claim 1 that detects the end of roll of rolled paper product and indexes another roll of rolled paper product for dispensing.

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