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(54) Title: A SYSTEM AND METHOD FOR AUTOMATED TESTING OF POINT OF SALE (POS)

(57) Abstract: A system and method for testing a Point Of Sale (POS) system is disclosed. The system includes a card repository comprising a plurality of card stacks configured to store a plurality of cards. The system further incudes a gripper configured to retrieve alicard from the plurality of cards and interface the card with a payment terminal. The system includes an input system configured to provide a code associated with the card to an interface of the payment terminal. The system further includes a controller communicatively coupled to each of the payment terminal, the card repository, the gripper, and the input system. The controller instructs the gripper to retrieve the card from one of the plurality of card stacks and to interface the card with the payment tefininal. The controller further instructs the input system to provide the code , on the interface.

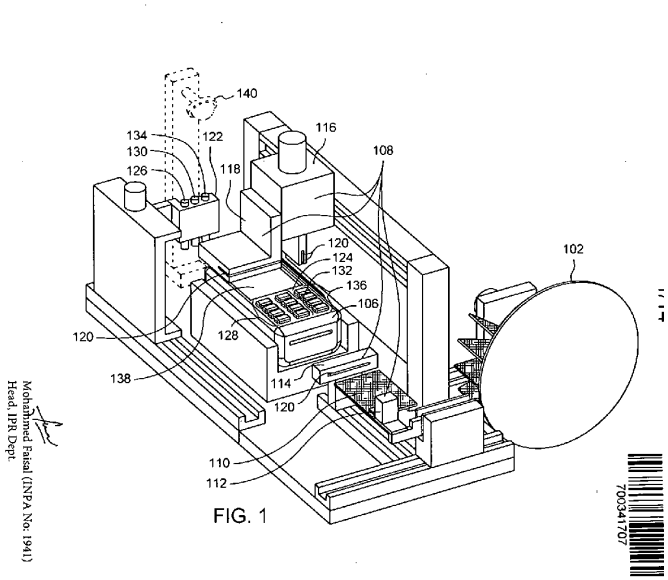

FIG. 1

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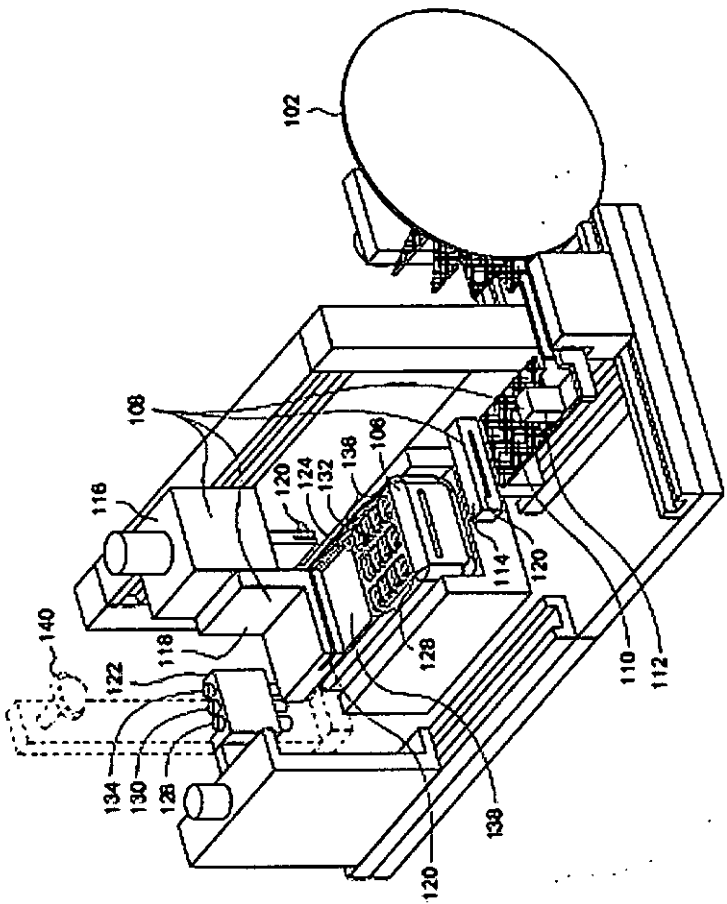
ABSTRACT

A system and method for testing a Point Of Sale (POS) system is disclosed. The system includes a card repository comprising a plurality of card stacks configured to store a plurality of cards. The system further incudes a gripper configured to retrieve a card from the plurality of cards and interface the card with a payment terminal. The system includes an input system configured to provide a code associated with the card to an interface of the payment terminal. The system further includes a controller communicatively coupled to each of the payment terminal, the card repository, the gripper, and the input system. The controller instructs the gripper to retrieve the card from one of the plurality of card stacks and to interface the card with the payment terminal. The controller further instructs the input system to provide the code on the interface.



CLAIMS

What is claimed is:

1. A system for testing a Point Of Sale (POS) system, the system comprising:

a card repository comprising a plurality of card stacks configured to store a plurality of cards, wherein each of the plurality of cards is associated with an interface mode between a payment terminal within the POS system and the associated card;

a gripper configured to:

retrieve a card from the plurality of cards; and

interface the card with the payment terminal;

an input system configured to provide a code associated with the card to an interface of the payment terminal; and

a controller communicatively coupled to each of the payment terminal, the card repository, the gripper, and the input system, wherein the controller is configured to:

determine an action to be performed on the payment terminal based on a current state of the payment terminal;

instruct the gripper to retrieve the card from one of the plurality of card stacks and to interface the card with the payment terminal based on an interface mode associated with the card in response to determining the action; and

instruct the input system to provide the code on the interface of the payment terminal in response to the gripper interfacing the card with the payment terminal.

2. The system of claim 1, wherein the card repository is further configured to eject the card from the one of the plurality of card stacks, and wherein the controller is further configured to instruct the card repository to eject the card in response to determining the action as card scanning at the payment terminal.

3. The system of claim 1, wherein the gripper comprises a plurality of motors configured to move the gripper across a plurality of axis to enable the gripper to retrieve the card from the one of the plurality of card stacks and to interface the card with the payment terminal based on the interface mode associated with the card.

4. The system of claim 3, wherein the interface mode comprises at least one of a magnetic strip, a microprocessor chip, or a contactless scan.

5. The system of claim 4, wherein to interface the card with the payment terminal, the gripper is further configured to perform at least one of:

swiping the card on the payment terminal for the magnetic strip interface mode;

inserting the card in the payment terminal for the microprocessor chip interface mode; and

tapping the card on the payment terminal for the contactless scan interface mode.

6. The system of claim 5, wherein the gripper comprises a plurality of gripper portions, wherein each of the plurality of gripper portions is separately configured to perform at least one of:

retrieving the card from the one of the plurality of card stacks;

swiping the card on the payment terminal for the magnetic strip interface mode;

inserting the card in the payment terminal for the microprocessor chip interface mode;

tapping the card on the payment terminal for the contactless scan interface mode; and

placing back the card in the one of the plurality of card stacks after interfacing the card with the payment terminal.

7. The system of claim 3, wherein the gripper, via the plurality of motors, is further configured to withdraw the card after interfacing the card with the payment terminal and to place back the card in the one of the plurality of card stacks.

8. The system of claim 1 further comprising:

an image capturing device configured to capture an image of a display of the payment terminal; and

a memory communicatively coupled to the controller, wherein the memory comprises a plurality of stored images.

9. The system of claim 8, wherein to determine the action to be performed on the payment terminal, the controller is further configured to compare the captured image with the plurality of stored images to identify a stored image from the plurality of stored images that matches the captured image, and wherein the controller is further configured to determine the current state of the payment terminal based on the stored image.

10. The system of claim 1, wherein the controller is further configured to determine the current state of the payment terminal based on communication with the payment terminal.

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DESCRIPTION

Technical Field

[001] This disclosure relates generally to a testing system and, more particularly relates to system and method for testing Point Of Sale (POS) system.

Background

[002] A Point of sale (POS) terminal is an electronic device used for processing payments from a customer's account to a seller's account. Customers having a payment card may pay for a purchase by interfacing the card with the POS terminal and entering the card information (for example, a Personal Identification Number (PIN)) in the POS terminal. The POS terminal may perform the transaction by reading the information off the payment card, transferring the payment to the seller's account, and printing a receipt of the transaction.

[003] In order to test performance of a POS terminal and a card, the card (i.e., test card) is interfaced with the POS terminal multiple times. For example, the number of times the card is interfaced with the POS terminal may be in thousands. The interface mode between the card and the POS terminal may be swiping (for magnetic strip), insert (for microprocessor chip), or tapping/hovering (for a contactless card). For example, in the swipe mode of interaction, a user manually swipes the card thousands of times to check ability of the POS terminal to accurately read the card. Thus, manually performing the process of quality check requires a great deal of effort as well as leads to wastage of time.

[004] Some conventional devices automatically test the performance of the POS terminal and the payment cards. However, these conventional devices are capable of testing cards that only have a single interface mode at a given time. Thus, it is difficult to test multiple cards having different interface modes in a single test cycle.

[005] There is therefore a need for an improved and automatic system that efficiently performs testing of POS terminals without requiring human intervention.

SUMMARY

[006] In one embodiment, a system for testing a Point Of Sale (POS) system is disclosed. The system includes a card repository comprising a plurality of card stacks configured to store a plurality of cards. Each of the plurality of cards is associated with an interface mode between a payment terminal within the POS system and the associated card. The system further includes a gripper configured to retrieve a card from the plurality of cards and to interface the card with the payment terminal. The system includes an input system configured to provide a code associated with the card to an interface of the payment terminal. The system further includes a controller communicatively coupled to each of the payment terminal, the card repository, the gripper, and the input system. The controller is configured to determine an action to be performed on the payment terminal based on a current state of the payment terminal. The controller is further configured to instruct the gripper to retrieve the card from one of the plurality of card stacks and to interface the card with the payment terminal based on an interface mode associated with the card in response to determining the action. The controller is configured to instruct the input system to provide the code on the interface of the payment terminal in response to the gripper interfacing the card with the payment terminal.

[007] In another embodiment, a method of testing a POS system is disclosed. The method includes determining a current state of a payment terminal within the POS system. The method further includes determining an action to be performed on the payment terminal based on the current state. The method includes retrieving a card from one of a plurality of card stacks. The plurality of card stacks are configured to store a plurality of cards. Each of the plurality of cards is associated with an interface mode between the payment terminal and the associated card. The method further includes interfacing the card with the payment terminal based on the interface mode associated with the card. The method includes providing a code associated with the card to an interface of the payment terminal in response to interfacing the card with the payment terminal.

[008] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[009] The accompanying drawings, which are incorporated in and constitute a part of this disclosure, illustrate exemplary embodiments and, together with the description, serve to explain the disclosed principles.

[010] FIG. 1 illustrates an isometric view of a system for testing a Point Of Sale (POS) terminal, in accordance with an embodiment.

[011] FIGs. 2A and 2B illustrate an isometric view of a section of a system for testing a POS terminal depicting retrieval of a card from a card repository and subsequent placing back of the card in the card repository, in accordance with an embodiment.

[012] FIGs. 3A and 3B illustrate an isometric view of a section system for testing a POS system using a card that has microprocessor chip as the interface mode, in accordance with an embodiment.

[013] FIGs. 4A and 4B illustrate an isometric view of a section of a system for testing a POS system using a card that has magnetic strip as the interface mode, in accordance with an embodiment.

[014] FIGs. 5A, 5B, and 5C illustrate an isometric view of a section of a system for testing a POS system using a card that has contactless scan as the interface mode, in accordance with an embodiment.

[015] FIG. 6 illustrates an isometric view of a section of a system depicting entry of a code by an input system on a keypad of a payment terminal, in accordance with an embodiment.

[016] FIG. 7 illustrates an isometric view of a system for testing a POS system, in accordance with another embodiment.

[017] FIG. 8 illustrates a schematic block diagram of a system for testing a POS system, in accordance with an embodiment.

[018] FIG. 9 illustrates a flowchart of a method for testing a POS system, in accordance with an embodiment.

DETAILED DESCRIPTION

[019] Exemplary embodiments are described with reference to the accompanying drawings. Wherever convenient, the same reference numbers are used throughout the drawings to refer to the same or like parts. While examples and features of disclosed principles are described herein, modifications, adaptations, and other implementations are possible without departing from the spirit and scope of the disclosed embodiments. It is intended that the following detailed description be considered as exemplary only, with the true scope and spirit being indicated by the following claims.

[020] Referring now to FIG. 1, an isometric view of a system 100 for testing a Point Of Sale (POS) system (not shown in FIG. 1) depicting retrieval of a card from a card repository 102 in the system 100 is illustrated, in accordance with an embodiment. It will be apparent to a person skilled in the art that the system 100 is not limited by the shape and form of the card repository 102 as depicted in FIG. 1 and other shapes and forms of the card repository 102 are within the scope of the embodiment. The card repository 102 within the system 100 further includes a plurality of card stacks 104 (not shown in FIG. 1) configured to store a plurality of cards. In an embodiment, each of the plurality of card stacks 104 stores a single card. Alternately, each of the plurality of card stacks 104 may store multiple cards. Examples of the cards may include, but are not limited to credit cards, debit cards, membership cards, loyalty cards, or discount cards.

[021] Each of the plurality of cards is associated with an interface mode between a payment terminal 106 within the POS system and the associated card. The payment terminal 106, for example, may include, but is not limited to a credit card terminal, a debit card terminal, or an Electronic Funds Transfer at Point of Sale (EFTPOS) terminal. The payment terminal 106 may be a fixed (wired) payment terminal or a portable (wireless) payment terminal. The interface mode may include, but is not limited to one or more of a magnetic strip, a microprocessor chip, or a contactless scan. When the interface mode is the magnetic strip, a card may have to be swiped on an associated card reader (not shown in FIG. 1) within the payment terminal 106. When the interface mode is the microprocessor chip, the card may have to be inserted in an associated card reader (not shown in FIG. 1) within the payment terminal 106. Lastly, when

the interface mode is the contactless scan, the card may have to be tapped or hovered over an associated card reader (not shown in FIG. 1) of the payment terminal 106. In an embodiment, each of the plurality of card stacks 104 may store cards that have a particular interface mode. By way of an example, a first card stack may store cards that only have a magnetic strip and a second card stack may store cards that only include a microprocessor chip.

[022] The system 100 further includes a gripper 108 that is configured to retrieve a card 110 from the plurality of cards at a given time. The gripper 108 is further configured to interface the card 110 with the payment terminal 106. As there are three different interface modes (i.e., magnetic strip, a microprocessor chip, or a contactless scan) associated with the plurality of cards and the payment terminal 106, the gripper 108 may include a plurality of gripper portions. For example, the gripper 108 may include a first gripper portion 112, a second gripper portion 114, a third gripper portion 116, and a fourth gripper portion 118, as depicted in FIG. 1. Each of the plurality of gripper portions may include a plurality of motors. By way of an example, each of the plurality of gripper portions may include one or more servo motors and one or more Direct Current (DC) motors. Each of the one or more servo motors may enable an associated gripper portion of the plurality of gripper portions to grip and/or to rotate the card 110. Whereas, each of the one or more DC motors may enable an associated gripper portion to move the card 110 in one or more of a horizontal, a vertical, or a diagonal direction. Each of the first gripper portion 112, the second gripper portion 114, the third gripper portion 116, and the fourth gripper portion 118 further include two or more gripper teeth 120 that may be used to grip the card 110.

[023] The first gripper portion 112 may be configured to retrieve the card 110 from a card stack of the plurality of card stacks 104. Retrieval of the card 110 by the first gripper portion 112 is depicted in detail in conjunction with FIG. 2A. In an embodiment, the card repository 102 may be configured to eject the card 110 from the card stack for subsequent retrieval by the first gripper portion 112. In this case, after the card 110 is ejected, the first gripper portion 112 may retrieve the card 110. After retrieval, the first gripper portion 112 may also reposition the card 110, such that, one of the second gripper portion 114, the third gripper portion 116, or the fourth gripper portion 118 may grip and retrieve the card 110 from the first gripper portion 112. To this end, the first gripper portion 112 may include a servo motor (not shown in FIG. 1) to grip the card 110 in order to retrieve the card 110 from the card repository 102. The first

gripper portion 110 may also include another servo motor that is configured to rotate the card 110 for appropriate placement, such that, the card 110 can be subsequently retrieved for interfacing with the payment terminal 106, by one of the second gripper portion 114, the third gripper portion 116, or the fourth gripper portion 118. The first gripper portion 112 may also be configured to place the retrieved card 110 back into the associated card stack. This is further depicted in detail in conjunction with FIG. 2B.

[024] When the card 110 has a microprocessor chip as the interface mode, after the card 110 has been retrieved from the card repository 102, the first gripper portion 112 positions the card 110, such that, the second gripper portion 114 may retrieve the card 110 that is currently gripped by the first gripper portion 112. To this end, the first gripper portion 112 and the second gripper portion 114 may be aligned, such that, they have the same Y coordinates and the same orientation. In an embodiment, the second gripper portion 114 may modify its vertical position in order to align with the first gripper portion 112, so that, the second gripper portion 114 may easily retrieve the card 110.

[025] The first gripper portion 112 may position the card 110, such that, the card 110 may be inserted in the microprocessor chip reader of the payment terminal 106. By way of an example, the card 110 may be positioned parallel to a surface (not shown in FIG. 1) on which the system 100 is placed. This is further depicted in detail in conjunction with FIG. 3A. To this end, a DC motor within the second gripper portion 114 may move the second gripper portion 114 in the horizontal direction towards the first gripper portion 112. When the second gripper portion 114 has reached a desired position, the servo motor enables the second gripper portion 114 to grip the card 110. At the same moment, a servo motor in the first gripper portion 112 loosens grip over the card 110, in order to release the card 110. The second gripper portion 114, enabled by the servo motor, grips the card 110. This is further depicted in detail in conjunction with FIG. 3A. Thereafter, the second gripper portion 114 may move in the horizontal direction toward the payment terminal 106 in order to interface the card 110 with the microprocessor card reader within the payment terminal 106. This is further depicted in detail in conjunction with FIG. 3B.

[026] In another embodiment, when the card 110 has a magnetic strip as the interface mode, after the card 110 has been retrieved from the card repository 102, the first gripper portion 112

positions the card 110, such that, the third gripper portion 116 may retrieve the card 110, which is currently gripped by the first gripper portion 112. To this end, the first gripper portion 112 and the third gripper portion 116 may be aligned, such that, they have the same Y coordinates and the same orientation. In an embodiment, the first gripper portion 112 may modify its orientation in order to align with the third gripper portion 116, such that, the third gripper portion 116 may retrieve the card 110. This is further depicted in detail in conjunction with FIG. 4A.

[027] The first gripper portion 112 may position the card 110, such that, the card 110 may be swiped on a magnetic strip reader of the payment terminal 106. By way of an example, the card 110 may be positioned perpendicular to a surface (not shown in FIG. 1) on which the system 100 is placed. This is further depicted in detail in conjunction with FIG. 4A. To this end, a DC motor within the third gripper portion 116 may move the third gripper portion 116 in the horizontal direction towards the first gripper portion 112. When the third gripper portion 116 has reached a desired position, a servo motor may enable the third gripper portion 116 to grip the card 110. At the same moment, a servo motor in the first gripper portion 112 loosens grip over the card 110, in order to release the card 110. The third gripper portion 116, enabled by the servo motor, grips the card 110. This is further depicted in detail in conjunction with FIG. 4A. Thereafter, the third gripper portion 116 moves in the horizontal direction toward the payment terminal 106 in order to interface the card 110 with the microprocessor chip reader within the payment terminal 106. This is further depicted in detail in conjunction with FIG. 4B.

[028] In yet another embodiment, when the card 110 has contactless scan as the interface mode, after the card 110 has been retrieved from the card repository 102, the first gripper portion 112 positions the card 110, such that, the fourth gripper portion 118 may retrieve the card 110, which is currently gripped by the first gripper portion 112. To this end, the first gripper portion 112 and the fourth gripper portion 118 may be aligned, such that, they have the same Y coordinates and the same orientation. In an embodiment, the fourth gripper portion 118 may modify its coordinates in order to align with the first gripper portion 112, so that, the fourth gripper portion 118 may retrieve the card 110. By way of an example, the fourth gripper portion 118 may change its Y coordinates, such that, the fourth gripper portion 118 is at the

same level as the first gripper portion 112. This is further depicted in detail in conjunction with FIG. 5A.

[029] The first gripper portion 112 may position the card 110, such that, the card 110 may be hovered over a contactless card reader of the payment terminal 106. By way of an example, the card 110 may be positioned parallel to the surface (not shown in FIG. 1) on which the system 100 is placed. The card 110 may be positioned slightly above an upper level of the payment terminal 106. This is further depicted in detail in conjunction with FIG. 5A. To this end, a DC motor within the fourth gripper portion 118 may move the fourth gripper portion 118 in the vertical direction, such that, the fourth gripper portion 118 is lowered down to the same level as the first gripper portion 112. This is further depicted in detail in conjunction with FIG. 5A. Thereafter, another DC motor within the fourth gripper portion 118 may move the fourth gripper portion 118 in the horizontal direction towards the first gripper portion 112. This is further depicted in detail in conjunction with FIG. 5B.

[030] When the fourth gripper portion 118 has reached a desired position, a servo motor may enable the fourth gripper portion 118 to grip the card 110. At the same moment, the servo motor in the first gripper portion 112 loosens grip over the card 110, in order to release the card 110. The fourth gripper portion 118, enabled by the servo motor, grips the card 110. This is further depicted in detail in conjunction with FIG. 5B. Thereafter, the fourth gripper portion 118 moves in the horizontal direction toward the payment terminal 106 in order to interface the card 110 with the contactless card reader within the payment terminal 106. By way of an example, the fourth gripper portion 118 may hover the card 110 over the contactless card reader. This is further depicted in detail in conjunction with FIG. 5C.

[031] In an embodiment, the gripper 108 may not include any gripper portion and may be a single and contiguous robotic arm (for example, a robotic arm 702) that is configured to retrieve the card 110 from the card repository 102, swipe the card 110 on the magnetic strip reader of the payment terminal 106, insert the card 110 in the microprocessor chip reader of the payment terminal 106, tap (or hover) the card 110 over the contactless card reader of the payment terminal 106, or place back the card 110 in the card repository 102 after interfacing the card 110 with the payment terminal 106. This is further depicted in detail in conjunction with FIG. 7.

[032] Once the card 110 has been interfaced with the payment terminal 106 through one of the first, second, or third interface mode, an input system 122 provides a code associated with the card 110 to an interface of the payment terminal 106. The code, for example, may be a 4 digit Personal Identification Number (PIN) that may be used to authorize a transaction associated with the card 110. The interface of the payment terminal 106 may be a keypad 124 (as depicted in FIG. 1). The keypad 124 may be a numeric keypad along with additional keys for accepting, cancelling, and correcting an input provided on the keypad 124. Alternatively, the interface of the payment terminal 106 may be a touch screen (not shown in FIG. 1). The input system 122 may be a punching system. In an embodiment, the input system 122 may be a solenoid operated PIN punching system that includes three cylindrical arms, each of which is aligned with one column of keys on the keypad 124. By way of an example, a cylindrical arm 126 is aligned with a key column 128, a cylindrical arm 130 is aligned with a key column 132, and a cylindrical arm 134 is aligned with a key column 136. In order to provide the code associated with the card 110, each cylindrical arm may press one or more keys in the associated key column. This is further depicted in detail in conjunction with FIG. 6.

[033] When the gripper 108 is a single and contiguous robotic arm (the robotic arm 702) as depicted in FIG. 7, the input system 122 may be replaced with another single and contiguous robotic arm (a robotic arm 704) that may be configured to provide the code to the interface of the payment terminal 106. In this case, the robotic arm 704 may have a single cylindrical arm that may be used to press multiple keys on the keypad 124 in order to provide the code. This is further depicted in detail in conjunction with FIG. 7.

[034] The system 100 may further include a controller (not shown in FIG. 1). The controller may be communicatively coupled to each of the payment terminal 106, the card repository 102, the gripper 108, and the input system 122. The controller may be a microcontroller. It will be apparent to a person skilled in the art that the specifications of the microcontroller may vary depending on the requirements of the system 100. The controller may further include peripherals to carry out functions with respect to the controller. The peripherals of the controller may include one or more input and output ports to facilitate flow of signal between the system 100 and the controller. The controller may further include analog/digital converters. The controller may be uploaded with a test script for each test cycle. The test script may include the details of all the cards that are to be tested with the payment terminal 106, in a sequence.

[035] When the system 100 initiates testing of the POS system, the controller first determines an action to be performed on the payment terminal 106 based on a current state of the payment terminal 106. The current state of the payment terminal 106 may be displayed on a display 138. Examples of the current state of the payment terminal 106 may include, but are not limited to "swipe the card", "insert the card," "tap the card," "enter the PIN," "remove the card," "transaction complete," "print receipt," or "print customer copy," etc. It will be apparent to a person skilled in the art that these examples are merely illustrative and the current state as displayed on the display 138 may vary based on the type and make of the payment terminal 106.

[036] The controller may determine the current state of the payment terminal 106 based on communication with the payment terminal 106. In other words, the payment terminal 106 may periodically communicate its current state to the controller after expiry of a predefined term interval. Alternatively, the payment terminal 106 may communicate the current state to the controller, whenever there is a change in the current state of the payment terminal 106. Based on the current state of the payment terminal 106, the controller may determine an action to be performed on the payment terminal 106.

[037] Alternatively, in order to determine the current state of the payment terminal 106, the system 100 may include an image capturing device 140, which, for example, may be a camera. Alternatively, the image capturing device 140 may be a video recorder. It will be apparent to a person skilled in the art that the image capturing device 140 may not be limited to cameras and video recorders, and other image capturing devices known in the art may also be employed. The image capturing device 140 may be placed, such that, it may capture an image of the display 138 of the payment terminal 106. By way of an example, the image capturing device 140 may be placed directly over the display 138 as illustrated in the FIG. 1. The image capturing device 140 may be arranged such that the image capturing device captures an image of the display 138 at predefined time intervals. The image capturing device 140 may further send the captured image to the controller on a continuous basis. In this case, the system 100 may include a memory (not shown in FIG. 1) that is communicatively coupled to the controller. The memory may include a plurality of stored images, such that, each stored image is associated with a state of the payment terminal 106, as displayed on the display 138. It will be apparent to a person skilled in the art that the memory may include separate set of stored images

for various make and models of payment terminals. As a result, the system 100 is independent of the model of the payment terminal 106 being used. In this case, in order to determine the action to be performed on the payment terminal 106, the controller may compare the captured image with the plurality of stored images. Based on the comparison, the controller may identify a stored image from the plurality of stored images that matches the captured image. The controller may then determine the current state of the payment terminal 106 based on the stored image. The controller may determine an action to be performed on the payment terminal 106 using the determined current state.

[038] When the action to be performed on the payment terminal 106 is determined as "interface the card 110," the controller may instruct the gripper 108 to retrieve the card 110 from one of the plurality of card stacks 104. The controller may then interface the card 110 with the payment terminal 106 based on an interface mode associated with the card 110. The mechanism of interfacing the card 110 with the payment terminal 106 has been explained in detail above. The controller may control each of the first gripper portion 112, the second gripper portion 114, the third gripper portion 116, the fourth gripper portion 118, and the card repository 102, in order to interface the card 110 with the payment terminal 106.

[039] Further, once the card 110 has been interfaced with the payment terminal 106 and the current state of the payment terminal 106 has changed to "Enter PIN" or "Provide PIN," the controller may instruct the input system 122 to provide the code (or the PIN) on the keypad 124. Once the input system 122 has provided the code on the keypad 124, the current status of the payment terminal 106 may change to "transaction complete." Based on this, the controller may complete a current testing iteration of the POS system using the card 110. The controller may then initiate testing of the POS system using another card stored in the plurality of card stacks 104. The details regarding location of a card of a particular interface mode within the plurality of card stacks 104 may be stored in the memory and may be provided to the controller. A schematic block diagram of the system 100 for testing the POS system is illustrated in conjunction with FIG. 8.

[040] Referring now to FIGs. 2A and 2B, an isometric view of a section of the system 100 for testing the POS terminal depicting retrieval of the card 110 from the card repository 102 and subsequent placing back of the card 110 in the card repository 102 is illustrated, in

accordance with an embodiment. As depicted in FIG. 2A, the card repository 102 may be circular in shape, such that, the card repository 102 is rotatable by way of a motor (not shown in FIG. 2A) around its central axis (not depicted in FIG. 2A). In the FIG. 2A, the controller instructs the first gripper portion 112 to retrieve the card 110 from a card stack of the plurality of card stacks 104. Additionally, the controller may instruct the card repository 102 to rotate, by way of the motor, in order to align the card stack with the two or more gripper teeth 120 of the first gripper portion 112. The controller may additionally instruct the card repository 102 to release grip over the card 110 in the card stack. Thus, the card repository 102 may be designed to release only one card at a given time. In an embodiment, the card repository 102 may eject the card 110 from the card stack. To this end, the card repository 102 may include an ejection mechanism (not shown in FIG. 2A and 2B). The controller may decide a type of card that is to be retrieved from the plurality of card stacks 104. The type of a card may correspond to various interface modes associated with cards. The interface mode, for example, may include, but are not limited to magnetic strip, microprocessor chip, and contactless scan. The card 110 may be selected based on the associated interface mode. The decision related to selection of the card 110 may be based on a test script that is being executed by the controller. By way of an example, if the test script includes instructions that a card having a magnetic strip as the interface mode is to be used for testing the POS system, then the controller may instruct the first gripper portion 112 to retrieve the card 110 having a magnetic strip. Additionally, the controller may instruct the card repository 102 to rotate and align the card stack (which holds the card 110) with the first gripper portion 112. Alternatively, an administrator testing the POS system may decide, via a Graphical User Interface (GUI) (not shown in FIGs. 2A and 2B), as to what type of card is to be used to test the POS system.

[041] In an embodiment, the placement of cards within the plurality of card stacks 104 along with their associated interface modes may be predefined and may be stored in a memory within the system 100. By way of an example, when the plurality of card stacks 104 includes nine different card stacks, the first, the fourth, and the seventh card stack may store cards with magnetic strip as the interface mode; the second, the fifth, and the eighth card stack may store cards with microprocessor chip as the interface mode; and the third, the sixth, and the ninth card stack may store cards with contactless scan as the interface mode. In another embodiment, the card repository 102 may have an inbuilt mechanism to identify interface mode of a card

that has been inserted into one of plurality of card stacks 104. In this case, cards can be placed randomly within the plurality of card stacks without focusing on accurate placement of cards in accordance with their associated interface modes.

[042] In order to retrieve the card 110 from the card stack, the controller may first align and reposition the first gripper portion 112, such that, the two or more gripper teeth 120 of the first gripper portion 112 may enclose the card 110. Thereafter, the controller may instruct the first gripper portion 112 to grip the card 110 through the two or more gripper teeth 120. After the two or more gripper teeth 120 have gripped the card, the controller may instruct the first gripper portion to extract the card 110 from the card stack for subsequent retrieval by one or more of the second gripper portion 114, the third gripper portion 116, and the fourth gripper portion 118. This has already been explained in detail in conjunction with FIG. 1.

[043] In the FIG. 2B, when testing of the POS system using the card 110 has been completed, the controller may instruct the first gripper portion 112 to place the card 110 back into the card stack. To this end, the controller may align and reposition the first gripper portion 112, such that, the card gripped by the two or more gripper teeth 120 of the first gripper portion 112, is inserted in the card stack. Thereafter, the controller may instruct the two or more gripper teeth 120 of first gripper portion 112 to loosen the grip over the card 110. The controller may further instruct the first gripper portion 112 to move back to its resting or original position. The resting or original position of the first gripper portion 112 may correspond to a state of the system 100 before testing of the POS system is initiated.

[044] Referring now to FIGs. 3A and 3B, an isometric view of a section of the system 100 for testing the POS system using the card 110 that has microprocessor chip as the interface mode is illustrated, in accordance with an embodiment. Referring back to FIG. 2A, when the first gripper portion 112 has retrieved the card 110 from the card stack, the controller may instruct the first gripper portion 112 to position the card 110, such that, the card 110 may be inserted in the microprocessor chip reader of the payment terminal 106. As depicted in FIG. 3A, the card 110 may be positioned parallel to a surface on which the system 100 is placed. In order to interface the card 110 with the microprocessor chip reader of the payment terminal 106, the controller may instruct the second gripper portion 114 to move, by way of a DC motor, in the horizontal direction towards the first gripper portion 112. When the second gripper

portion 114 has reached a desired position, where the two or more gripper teeth 120 of the second gripper portion 114 enclose the card 100, the controller instructs the two or more gripper teeth 120, by way of a servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, by way of a servo motor, to loosen grip over the card 110, in order to release the card 110.

[045] As depicted in FIG. 3B, once the two or more gripper teeth 120 of the second gripper portion 114 have gripped the card 110, the controller may instruct the second gripper portion 114, by way of the DC motor, to move in the horizontal direction towards the payment terminal 106 in order to interface the card 110 with the microprocessor chip reader within the payment terminal 106. Once the input system 122 has provided the code on the keypad 124 and the transaction is completed, the controller may instruct the second gripper portion 114, by way of the DC motor, to move in the horizontal direction towards the first gripper portion 112, such that, the card 110 is enclosed within the two or more gripper teeth 120 of the first gripper portion 112. Thereafter, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, by way of the servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the second gripper portion 114, by way of the servo motor, to loosen grip over the card 110, in order to release the card 110. This process is similar but opposite to what is depicted in FIG. 3A and is thus not depicted by way of a separate figure. Once the first gripper portion 112 has gripped the card 110, the controller instructs the first gripper portion 112 to place the card 110 back into the card stack. This has already been explained in detail in conjunction with FIGs. 2A and 2B.

[046] Referring now to FIGs. 4A and 4B, an isometric view of a section of the system 100 for testing the POS system using the card 110 that has magnetic strip as the interface mode is illustrated, in accordance with an embodiment. Referring back to FIG. 2A, when the first gripper portion 112 has retrieved the card 110 from the card stack, the controller may instruct the first gripper portion 112 to position the card 110, such that, the card 110 may be swiped on a magnetic strip reader of the payment terminal 106. As depicted in FIG. 4A, the first gripper portion 112 and the third gripper portion 116 may be aligned, such that, they have the same Y coordinates and the same orientation. The controller instructs the first gripper portion 112 to position the card 110, such that, the third gripper portion 116 may retrieve the card 110, which is currently gripped by the first gripper portion 112. To this end, the controller may instruct the

first gripper portion 112, by way of a servo motor, to position the card 110 perpendicular to a surface on which the system 100 is placed. Once the card 110 has been positioned perpendicular to the surface, the controller instructs the third gripper portion 116, by way of a DC motor, to move in the horizontal direction towards the first gripper portion 112. When the third gripper portion 116 has reached a desired position, such that, the two or more gripper teeth 120 of the third gripper portion 116 enclose the card 110, the controller instructs the two or more gripper teeth 120 of the third gripper portion 116, via the servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, via a servo motor, to loosen grip over the card 110, in order to release the card 110.

[047] As depicted in FIG. 4B, once the third gripper portion 116 has gripped the card 110, the controller instructs the third gripper portion 116, by way of the DC motor, to move in the horizontal direction toward the payment terminal 106 in order to interface the card 110 with the magnetic strip reader of the payment terminal 106. Once the input system 122 has provided the code on the keypad 124 and the transaction is completed, the controller may instruct the third gripper portion 116, by way of the DC motor, to move in the horizontal direction towards the first gripper portion 112, such that, the card 110 is enclosed within the two or more gripper teeth 120 of the first gripper portion 112. Thereafter, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, by way of the servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the third gripper portion 116, by way of the servo motor, to loosen grip over the card 110, in order to release the card 110. This process is similar but opposite to what is depicted in FIG. 4A and is thus not depicted by way of a separate figure. Once the first gripper portion 112 has gripped the card 110, the controller instructs the first gripper portion 112 to place the card 110 back into the card stack. This has already been explained in detail in conjunction with FIG. 2A and 2B.

[048] Referring now to FIGs. 5A , 5B, and 5c an isometric view of a section of the system 100 for testing the POS system using the card 110 that has contactless scan as the interface mode is illustrated, in accordance with an embodiment. Referring back to FIG. 2A, when the first gripper portion 112 has retrieved the card 110 from the card stack, the controller may instruct the first gripper portion 112 to position the card 110, such that, the card 110 may be

hovered or tapped over the contactless card reader of the payment terminal 106. The first gripper portion 112 and the fourth gripper portion 118 have different Y coordinates, thus in order to bring the fourth gripper portion 118 and the first gripper portion 112 at the same level, the controller instructs the fourth gripper portion 118, by way of a DC motor, to decrease Y coordinate of the fourth gripper portion 118, in order to lower the fourth gripper portion 118. In an embodiment, the first gripper portion 112 and the fourth gripper portion 118 may always be aligned, such that, they have the same Y coordinates and the same orientation. This is not depicted in FIGs. 5A, 5B, or 5C.

[049] As depicted in FIG. 5A, after the fourth gripper portion 118 has reached the same level as the first gripper portion 112, the first gripper portion 112 may position the card 110 parallel to a surface on which the system 100 is placed. This placement is similar to that depicted in FIG. 3A. Thereafter, the controller may instruct the fourth gripper portion 118 to move, by way of the DC motor, in the vertical direction, such that, the fourth gripper portion 118 is lowered down to the same level as the first gripper portion 112. Thereafter, the controller may instruct the fourth gripper portion 118 to move, by way of the DC motor, in the horizontal direction towards the first gripper portion 112, such that, the two or more gripper teeth 120 of the fourth gripper portion 118 enclose the card 110. The controller further instructs the two or more gripper teeth 120 of the fourth gripper portion 118, by way of a servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, via a servo motor, to loosen grip over the card 110, in order to release the card 110.

[050] Once the fourth gripper portion 118 has gripped the card 110, as depicted in FIG. 5B, the controller instructs, the fourth gripper portion 118 to move, by way of the DC motor, in the horizontal direction toward the payment terminal 106. Thereafter, in order to interface the card 110 with the contactless card reader, the controller instructs the fourth gripper portion 118 to move, by way of the DC motor, in a vertical direction to reach the original Y coordinates of the fourth gripper portion 118. As depicted in FIG. 5C, the controller then instructs the fourth gripper portion 118 to move in a horizontal direction, by way of the DC motor, over the payment terminal 106, in order to interface the card 110 with the contactless card reader by way of hovering or tapping the card 110 on the contactless card reader of the payment terminal 106.

[051] After the input system 122 has provided the code on the keypad 124 and the transaction is completed, the controller may instruct the fourth gripper portion 118, by way of the DC motor, to move in the horizontal direction towards the first gripper portion 112, such that, the card 110 is enclosed within the two or more gripper teeth 120 of the first gripper portion 112. Thereafter, the controller instructs the two or more gripper teeth 120 of the first gripper portion 112, by way of the servo motor, to grip the card 110. At the same moment, the controller instructs the two or more gripper teeth 120 of the fourth gripper portion 118, by way of the servo motor, to loosen grip over the card 110, in order to release the card 110. This process is similar but opposite to what is depicted in FIG. 5A and is thus not depicted by way of a separate figure. Once the first gripper portion 112 has gripped the card 110, the controller instructs the first gripper portion 112 to place the card 110 back into the card stack. This has already been explained in detail in conjunction with FIG. 2A and 2B.

[052] Referring now to FIG. 6, an isometric view of a section of the system 100 depicting entry of a code by the input system 122 on the keypad 124 of the payment terminal 106 is illustrated, in accordance with an embodiment. After the card 110 has been interfaced with the payment terminal 106, by way of any of the methods depicted in FIGs. 3A and 3B; FIGs. 4A and 4B; and FIGs. 5A, 5B, and 5C, the controller instructs the input system 122 to provide a code associated with the card 110 on the keypad 124. The controller may instruct the input system 122, based on a current state of the payment terminal 106, which has been changed to "Enter PIN" or "Provide PIN." The code, for example, may be a 4 digit PIN that may be used to authorize a transaction associated with the card 110.

[053] To this end, the controller may instruct the input system 122 to interface with the keypad 124. The input system 122 may include the cylindrical arm 126, the cylindrical arm 130, and the cylindrical arm 134. The controller may align the input system 122 over the keypad 124, such that the cylindrical arm 126 is aligned with the key column 128, the cylindrical arm 130 is aligned with the key column 132, and the cylindrical arm 134 is aligned with the key column 136. Thereafter, based on the numbers in the code, the controller instructs each of the cylindrical arms 126, 130, and 134 to press one or more keys in the associated key column. After the input system 122 has provided the code on the keypad 124, one of the cylindrical arms 126, 130, and 134 may press the "Enter" button to submit the code, in order to complete the transaction. When the current status of the payment terminal changes to

"transaction complete," the controller instructs the inputs system 122 to return back to the original or resting position of the input system 122.

[054] Referring now to FIG. 7, an isometric view of a system 700 for testing the POS system is illustrated, in accordance with another embodiment. The system 700 includes the robotic arm 702 that performs functionalities of the gripper 108. In this embodiment, each of the first gripper portion 112, the second gripper portion 114, the third gripper portion 116, and the fourth gripper portion 118, are replaced by the robotic arm 702. The robotic arm 702 may alone perform all the functionalities of the first gripper portion 112, the second gripper portion 114, the third gripper portion 116, and the fourth gripper portion 118, as described in the figures above. The controller may be in communication with the robotic arm 702 and may control the robotic arm 702 in order to perform various functionalities of the gripper 108.

[055] To this end, the robotic arm 702 may be movable in a horizontal axis (x axis), a vertical axis (y axis) and a depth axis (z axis). The movement of the robotic arm 702 for each mode of interaction may be programmed by an administrator and provided to the controller. The robotic arm 702 may also include the two or more gripper teeth 120, which may be termed as a gripper claw, and may operate to grip and release the card 110. In an embodiment, the robotic arm 702 may use three DC motors and two servo motors for achieving the functionalities of the gripper 108. A first servo motor may be used to position and rotate the card 110, such that, the card 110 is in a desired orientation for swiping, inserting, or tapping on the payment terminal 106. A second servo motor may be used to hold the card 110 tightly and to avoid slippage. The DC motors may be used to drive the robotic arm 702 in the three axes. A first DC Motor may use a belt drive to move the robotic arm 702 in the X-axis direction, a second DC motor may use a belt drive to move the robotic arm 702 in the Y-axis direction, and a third DC motor may be placed on top of the robotic arm 702, in order to move the robotic arm 702, in the Z-axis direction through a lead screw arrangement.

[056] In the system 700, the input system 122 may be replaced by the robotic arm 704. The controller may be in communication with the robotic arm 704 and may instruct the robotic arm 704 to perform all functionalities of the input system 122 as discussed in the FIG. 1 and FIG. 6. To this end, the robotic arm 704 may include a cylindrical arm 706. The robotic arm 704 may be similar to the robotic arm 702 with respect to various components and range of motion.

[057] Referring now to FIG. 8, a schematic block diagram 800 of the system 100 for testing the POS system is illustrated, in accordance with an embodiment. In the schematic block diagram 800, a controller 802 that is communicatively coupled to a memory 804 is depicted. The controller 802 is analogous to the controller described in the FIG. 1 to FIG. 7. The memory 804 is analogous to the memory described in the FIG. 1. The memory 804 may store a set of processor instruction or algorithm, which when executed by the controller 802 enables automatic testing of the POS system. The memory 804 may be a non-volatile memory or a volatile memory. Examples of the non-volatile memory, may include, but are not limited to a flash memory, a Read Only Memory (ROM), a Programmable ROM (PROM), Erasable PROM (EPROM), and Electrically EPROM (EEPROM) memory. Examples of volatile memory may include, but are not limited Dynamic Random Access Memory (DRAM), and Static Random-Access memory (SRAM).

[058] The controller 802 may be a microcontroller. It will be apparent to a person skilled in the art that the specifications of the microcontroller may vary depending on the requirements of the system 100. The controller 802 may further include peripherals to carry out functions with respect to the controller 802. The peripherals of the controller 802 may include one or more input and output ports to facilitate flow of signal between various components of the system 100 and the controller 802. The controller 802 may further include analog/digital converters. The controller 802 may be uploaded with a test script for each test cycle. The test script may include the details of all the cards in the sequence that are to be tested with the payment terminal 106.

[059] The controller 802 is communicatively coupled to each of the card repository 102, the payment terminal 106, the first gripper portion 112, the second gripper portion 114, the third gripper portion 116, the fourth gripper portion 118, the input system 122, and the image capturing device 140. The controller 802 may control the above-mentioned components in accordance with the description given in FIG.1 to FIG. 6.

[060] Referring now to FIG. 9, a flowchart of a method for testing the POS system is illustrated, in accordance with an embodiment. At step 902, a current state of the payment terminal 106 within the POS system is determined. The payment terminal 106 may directly communicate its current state to the controller 802. In an embodiment, at step 902a, an image

of the display 138 of the payment terminal 106 may be captured. Thereafter, at step 902b, the captured image may be compared with a plurality of stored images to identify a stored image from the plurality of stored images that matches the captured image. The current state of the payment terminal 106 may be determined based on the matching stored image. This has already been explained in detail in conjunction with FIG. 1.

[061] At step 904, an action to be performed on the payment terminal 106 is determined based on the current state determined at step 902. At step 906, the card 110 is retrieved from one of the plurality of card stacks 106. The plurality of card stacks 104 are configured to store a plurality of cards. Each of the plurality of cards is associated with an interface mode between the payment terminal 106 and the associated card. This has already been explained in detail in conjunction with FIG. 1 and FIGs. 2A and 2B.

[062] At step 908, the card 110 is interfaced with the payment terminal 106 based on the interface mode associated with the card 110. This has already been explained in detail in conjunction with FIGs. 3A and 3B, FIGs. 4A and 4B, and FIGs. 5A, 5B, and 5C. At step 910, a code associated with the card 110 is provided to an interface (for example, the keypad 124) of the payment terminal 106 in response to interfacing the card 110 with the payment terminal 106. This has already been explained in detail in conjunction with FIG. 6.

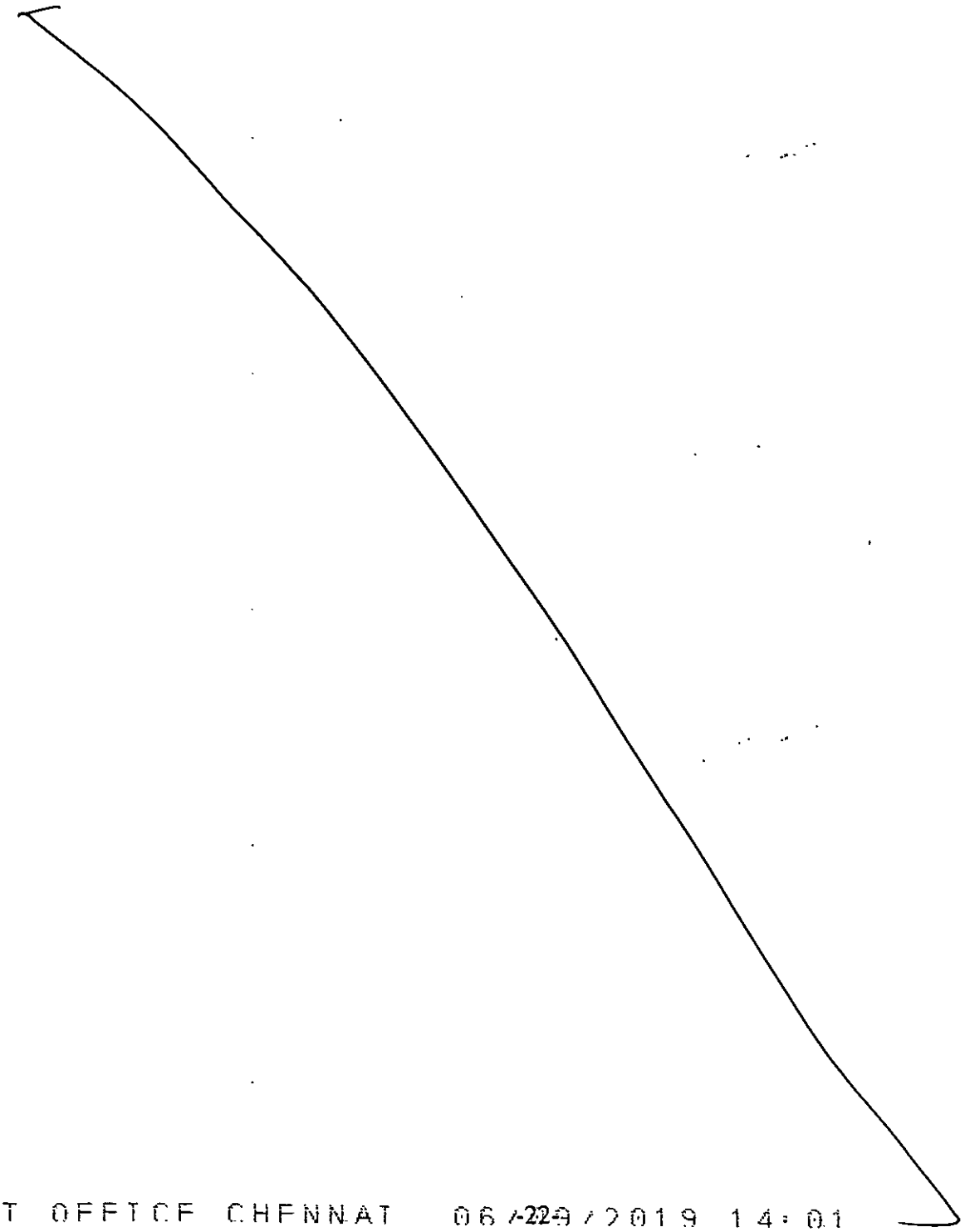
[063] After the card 110 has been interfaced with the payment terminal 106, the card 110 is withdrawn from the payment terminal 106 at step 912. The card 110 may be withdrawn, when an action to be performed based on the current state of the payment terminal 106 is determined as transaction processed. At step 914, the card 110 is placed back in the one of the plurality of card stacks. This has already been explained in detail in conjunction with FIGs. 2A and 2B.

[064] Various embodiments provide a system and method for testing POS systems. The system performs automated testing of payment terminals within POS systems. As a result, no manual intervention is required in accessing cards and interfacing them with a payment terminal. The system provides a low cost solution, which can be configured to cater to different test cases based on user requirements.

[065] The illustrated steps are set out to explain the exemplary embodiments shown, and it should be anticipated that ongoing technological development will change the manner in which particular functions are performed. These examples are presented herein for purposes of

illustration, and not limitation. Alternatives (including equivalents, extensions, variations, deviations, etc., of those described herein) will be apparent to persons skilled in the relevant art(s) based on the teachings contained herein. Such alternatives fall within the scope and spirit of the disclosed embodiments.

[066] It is intended that the disclosure and examples be considered as exemplary only, with a true scope and spirit of disclosed embodiments being indicated by the following claims.



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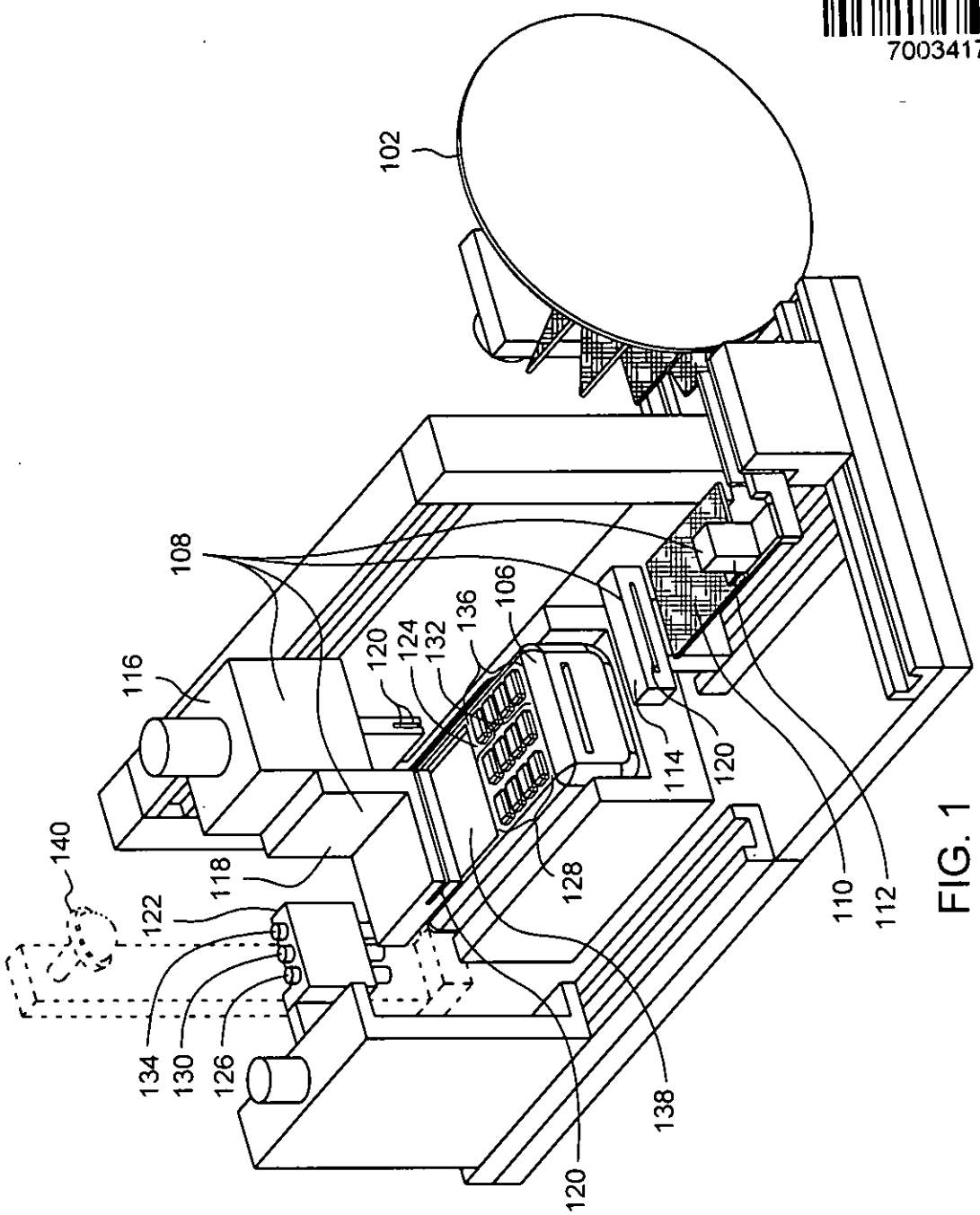

FIG. 1

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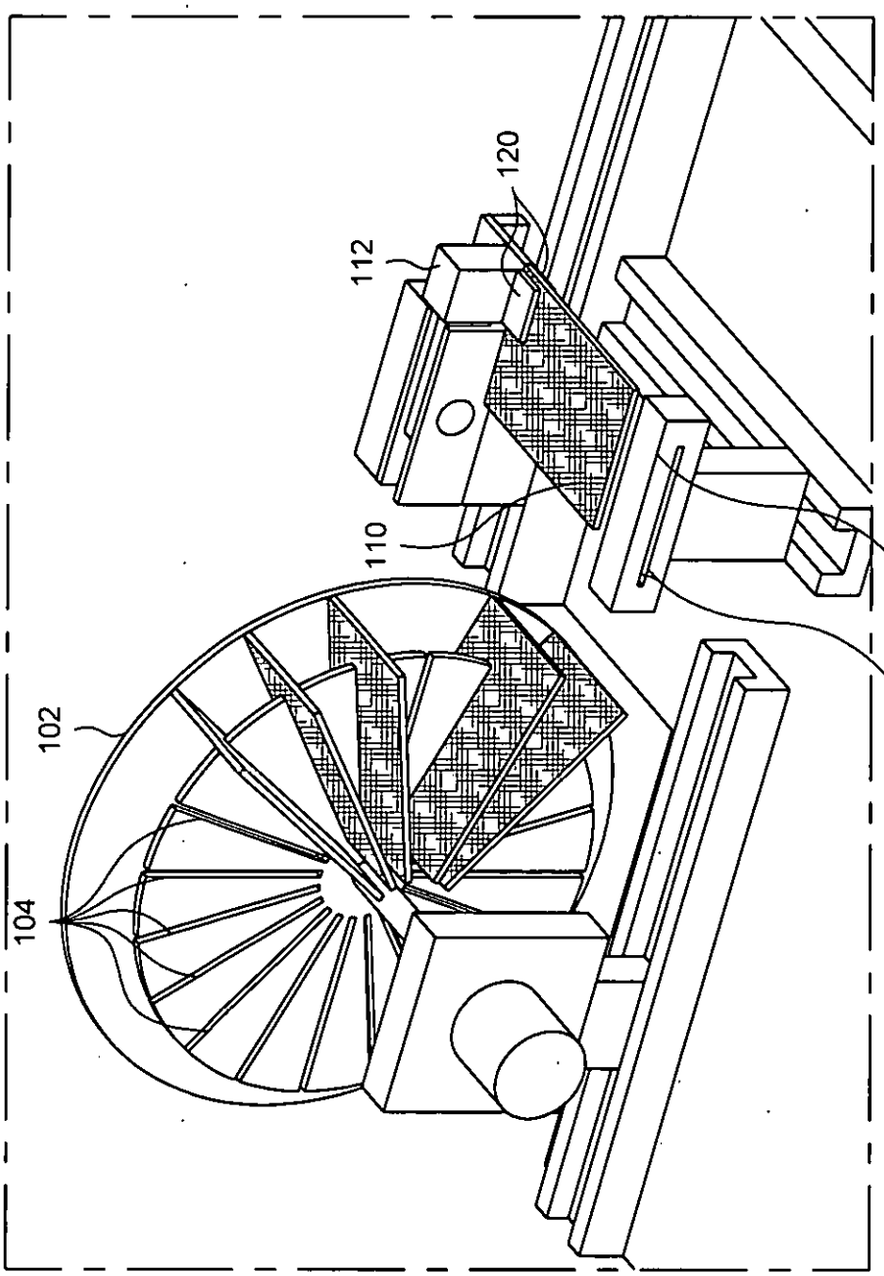

FIG. 2A

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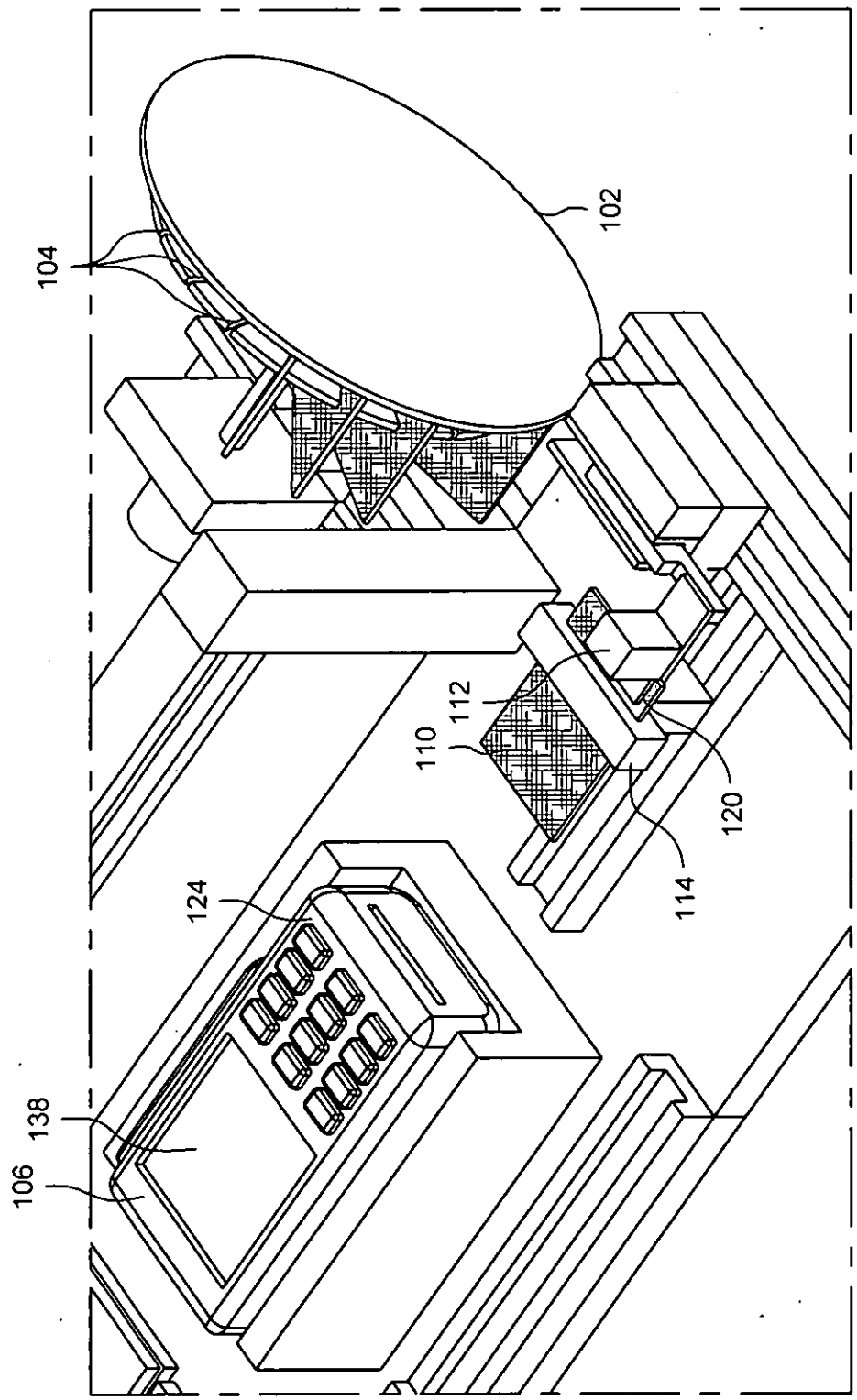

FIG. 3A

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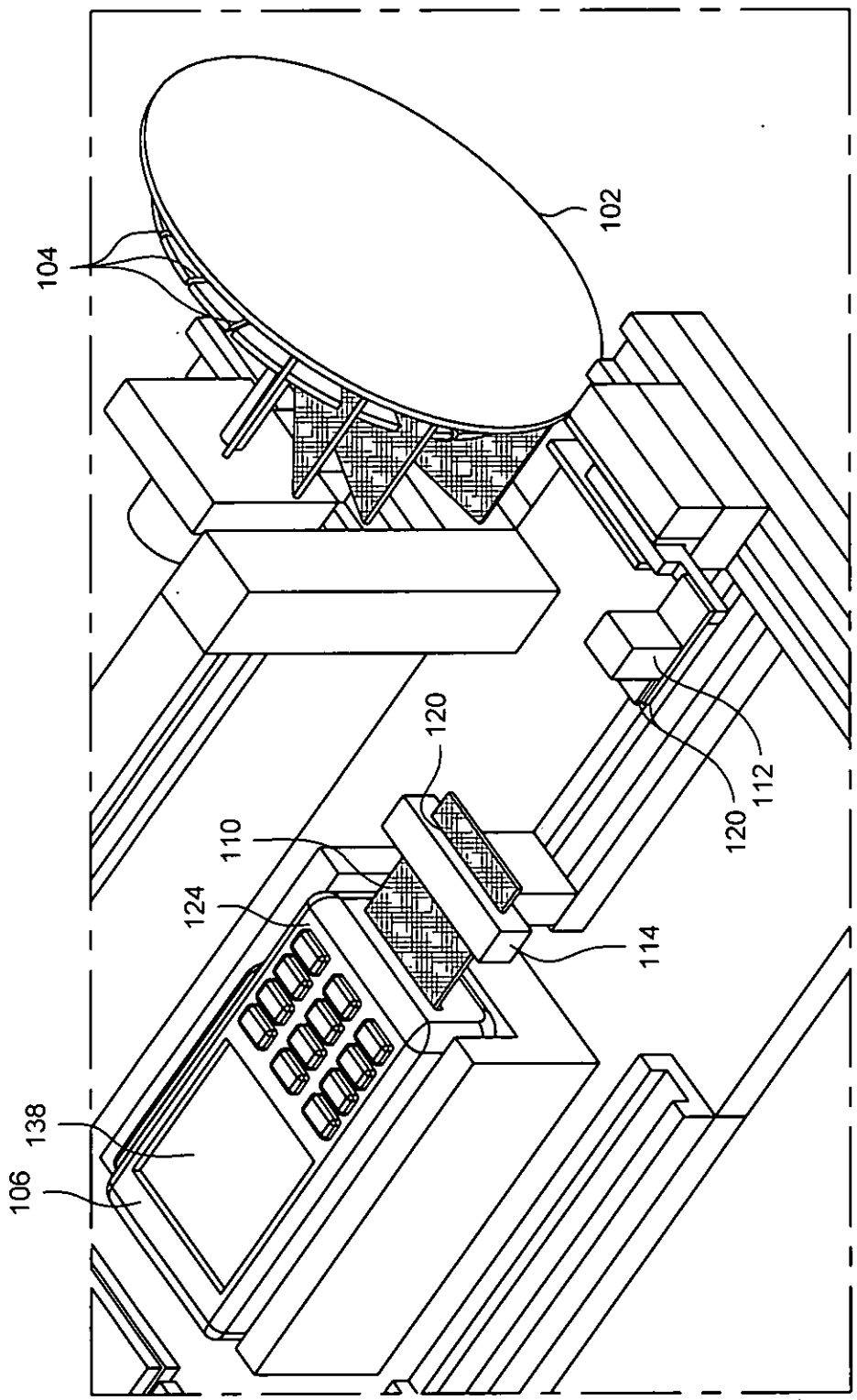

FIG. 3B

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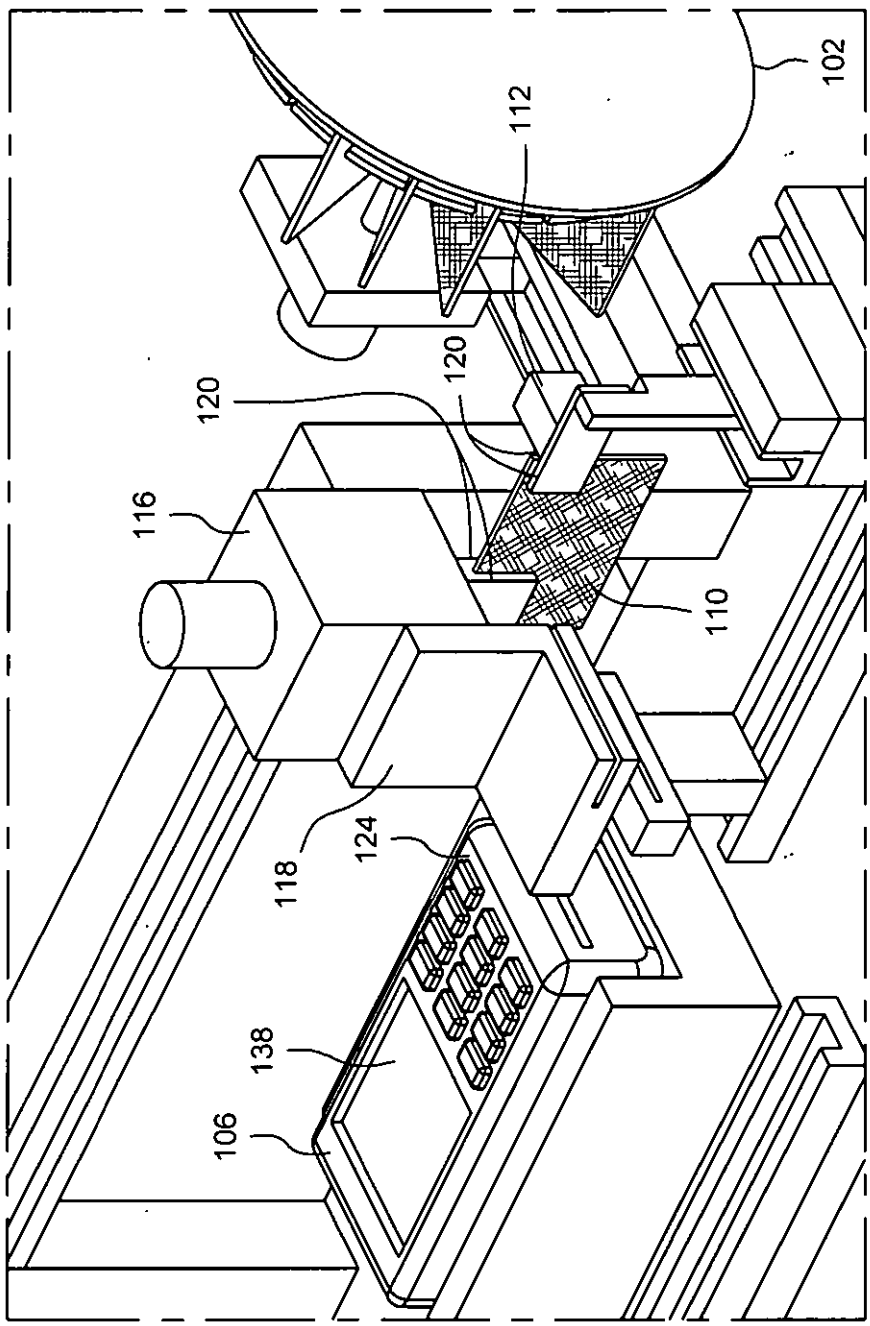

FIG. 4A

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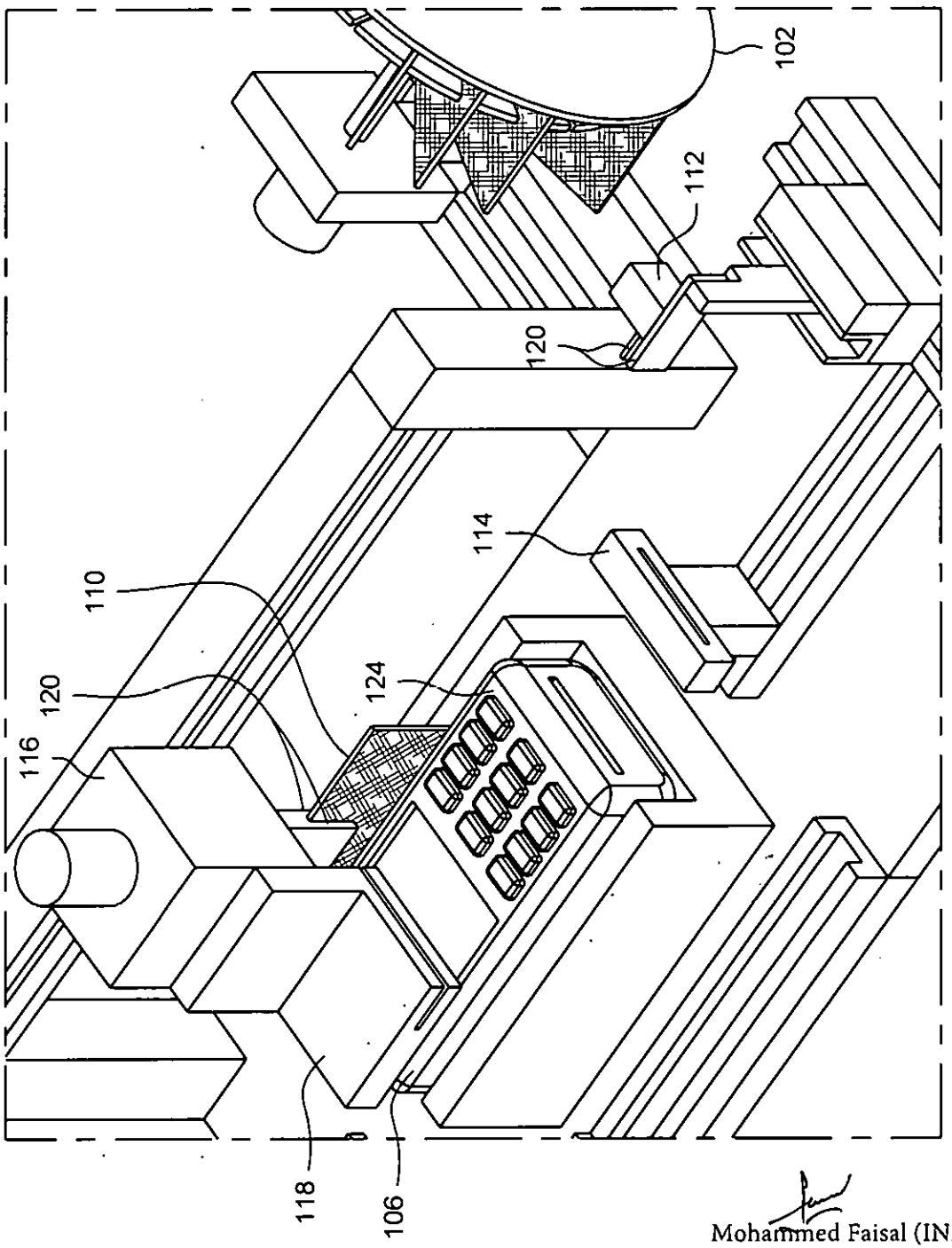

FIG. 4B

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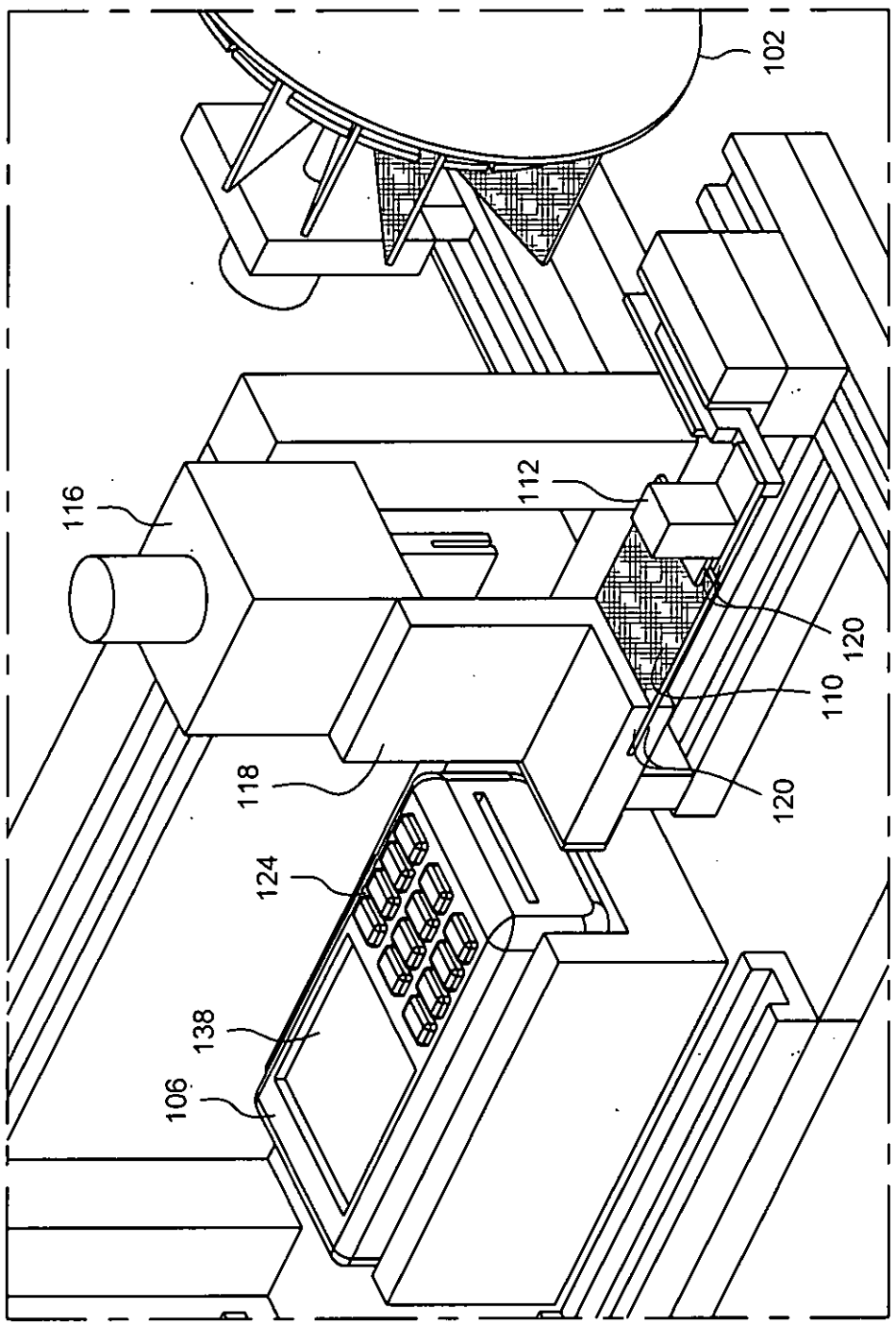

FIG. 5A

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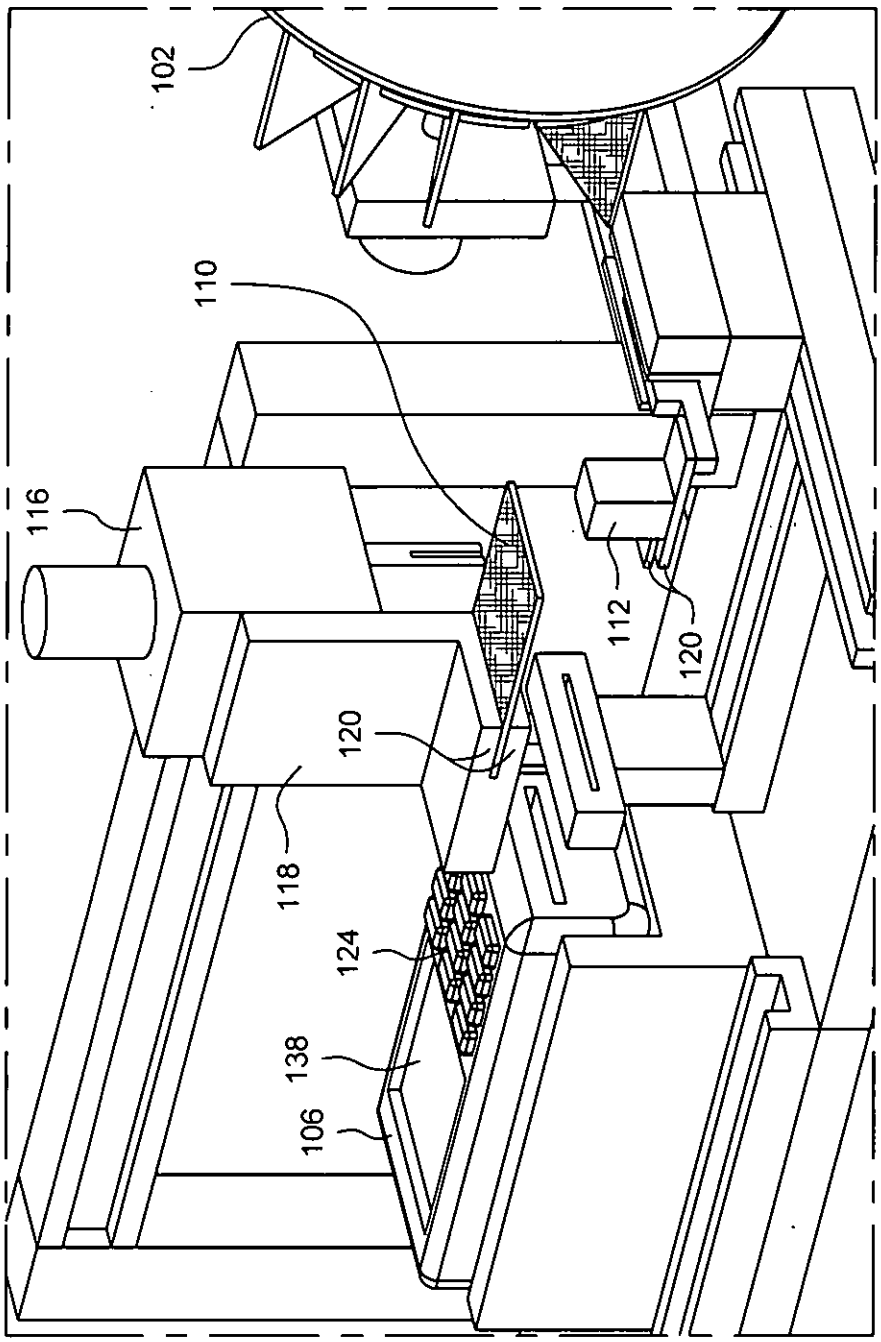

FIG. 5B

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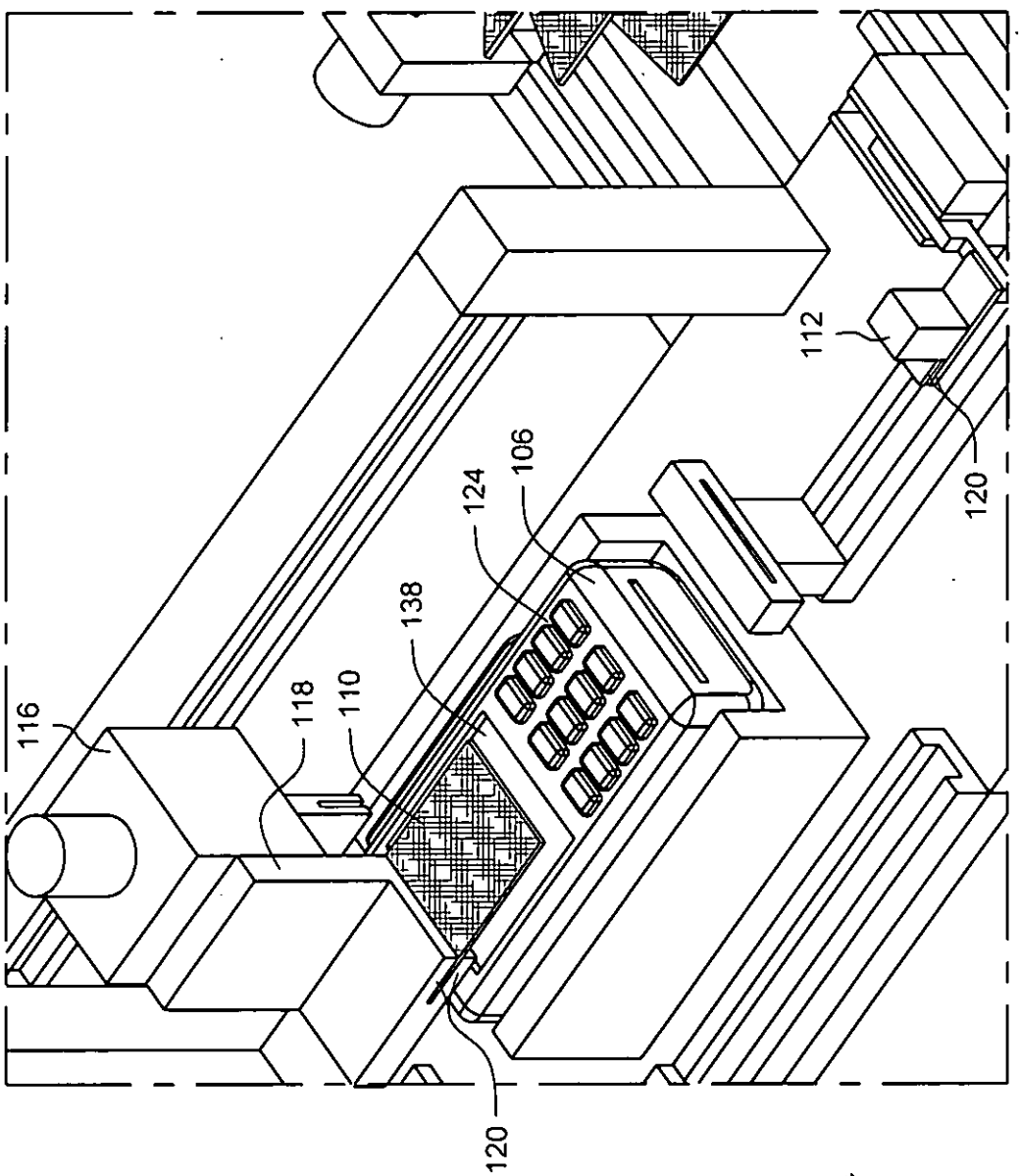

FIG. 5C

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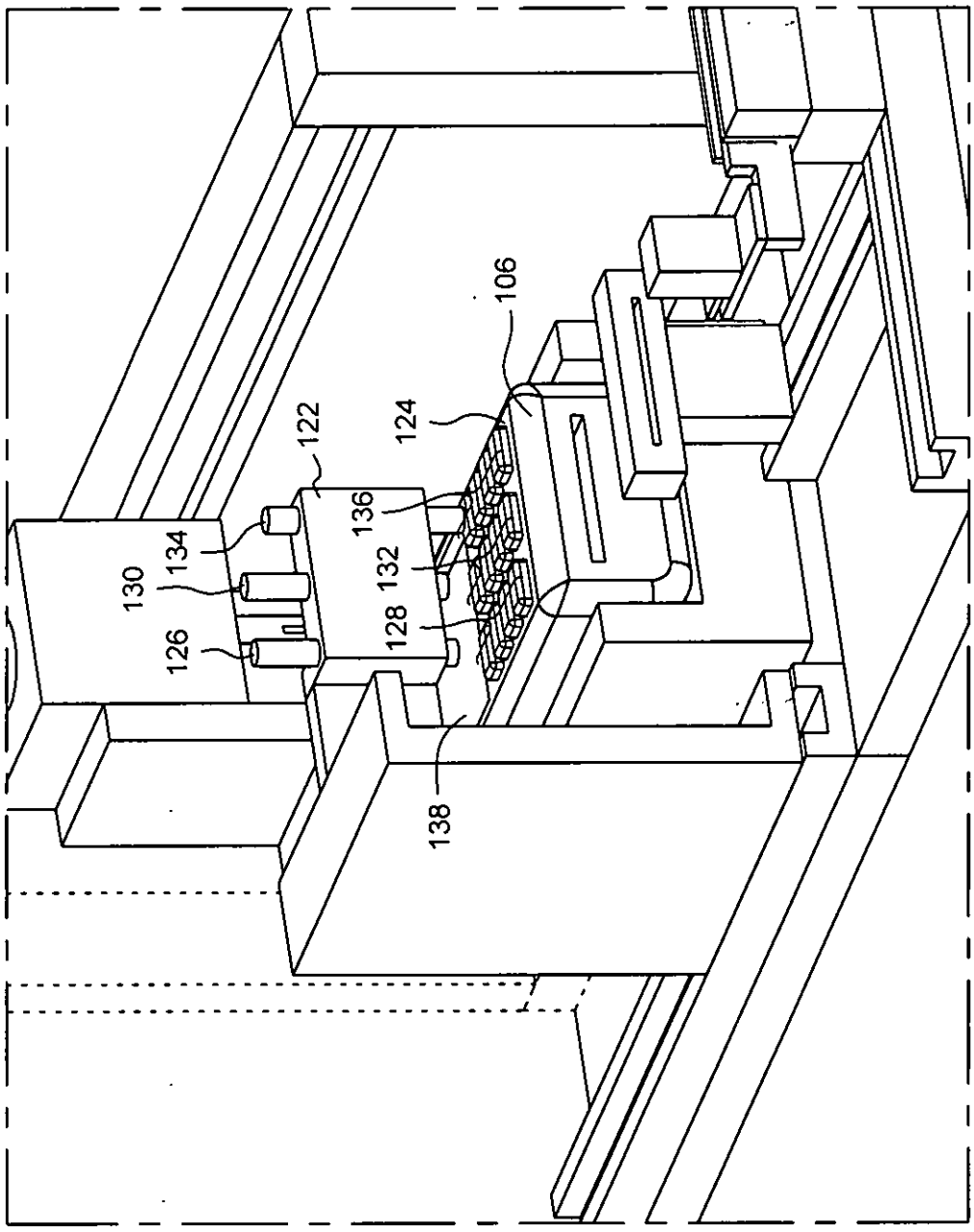

FIG. 6

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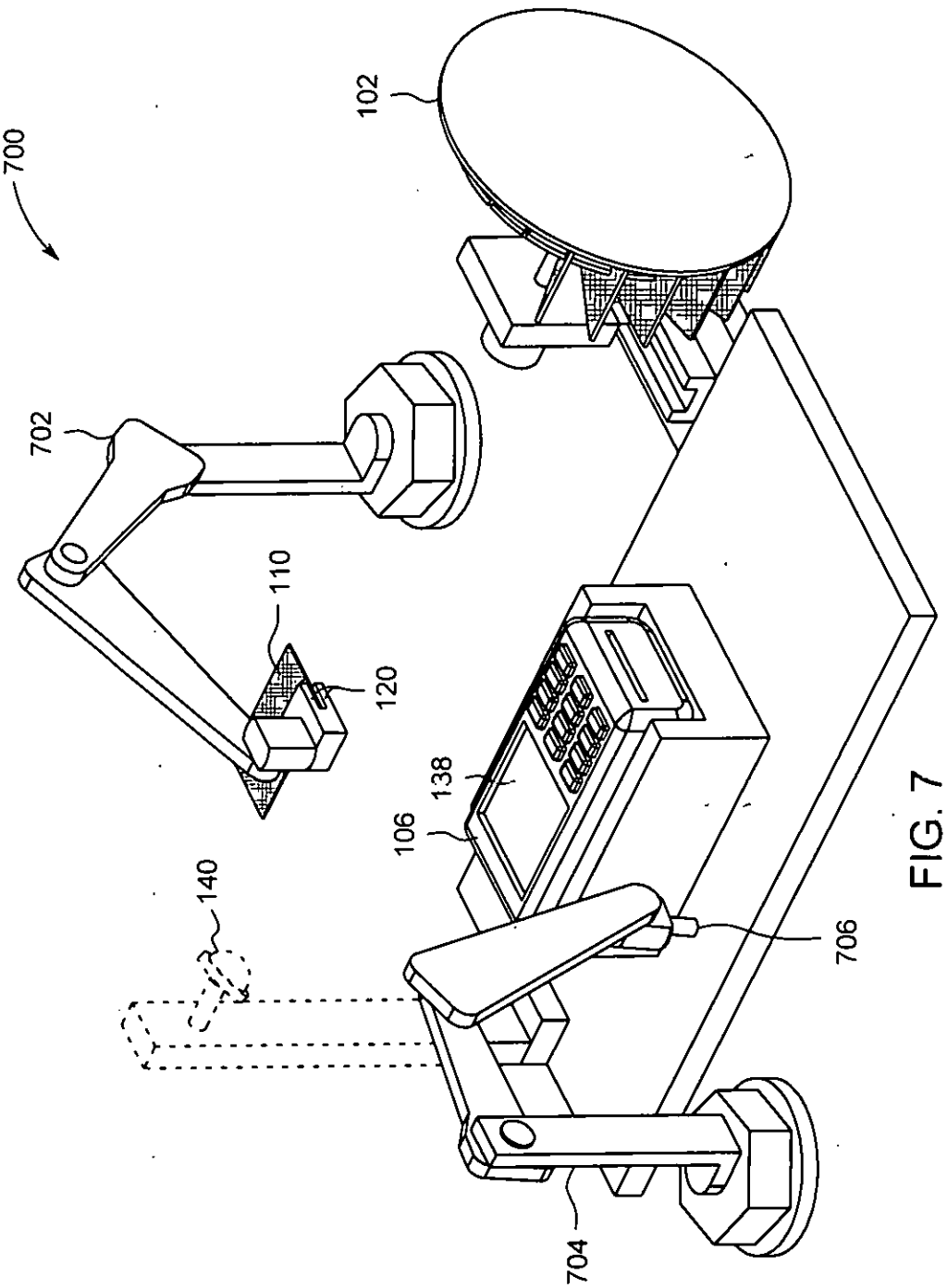

FIG. 7

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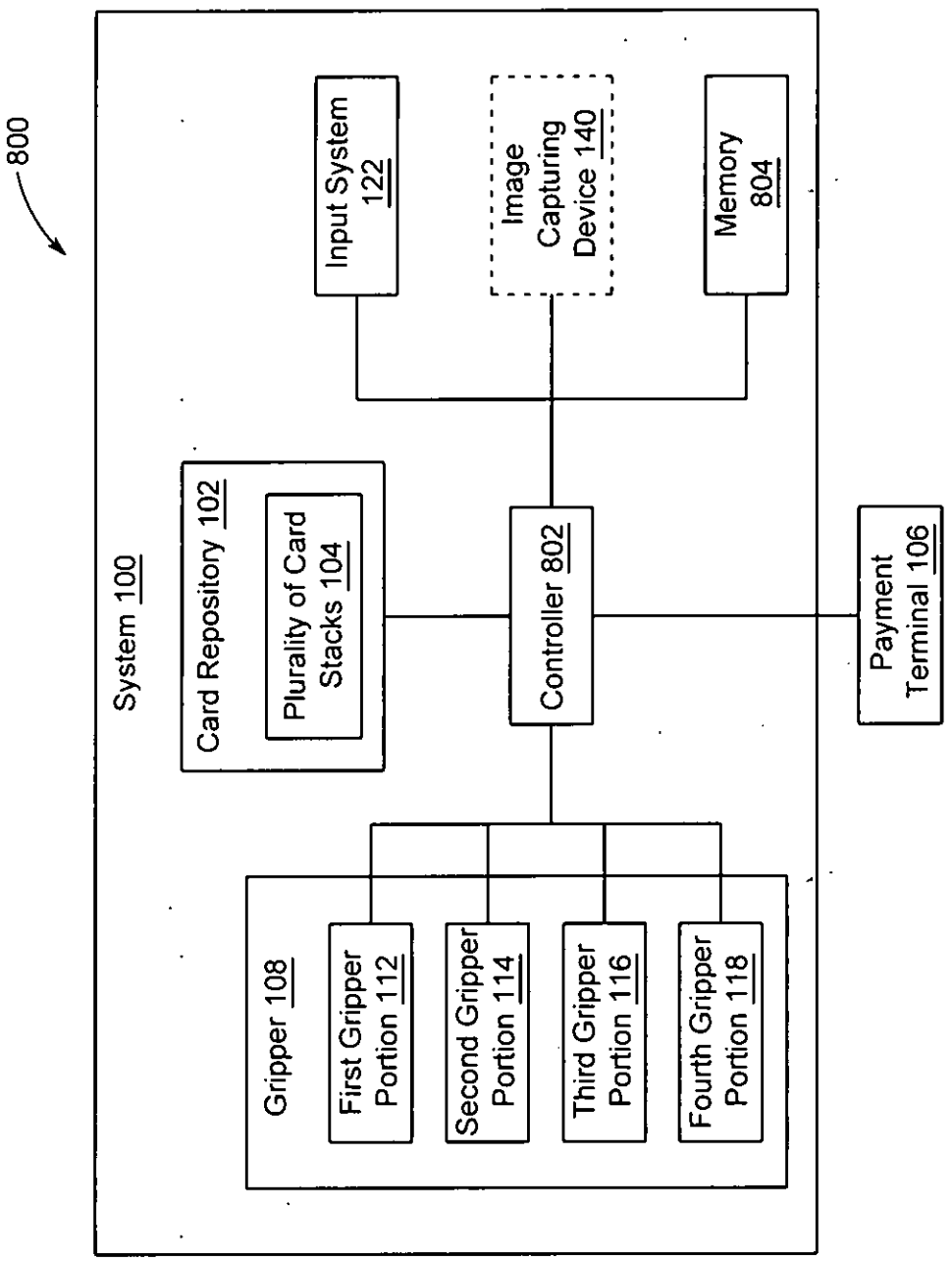

FIG. 8

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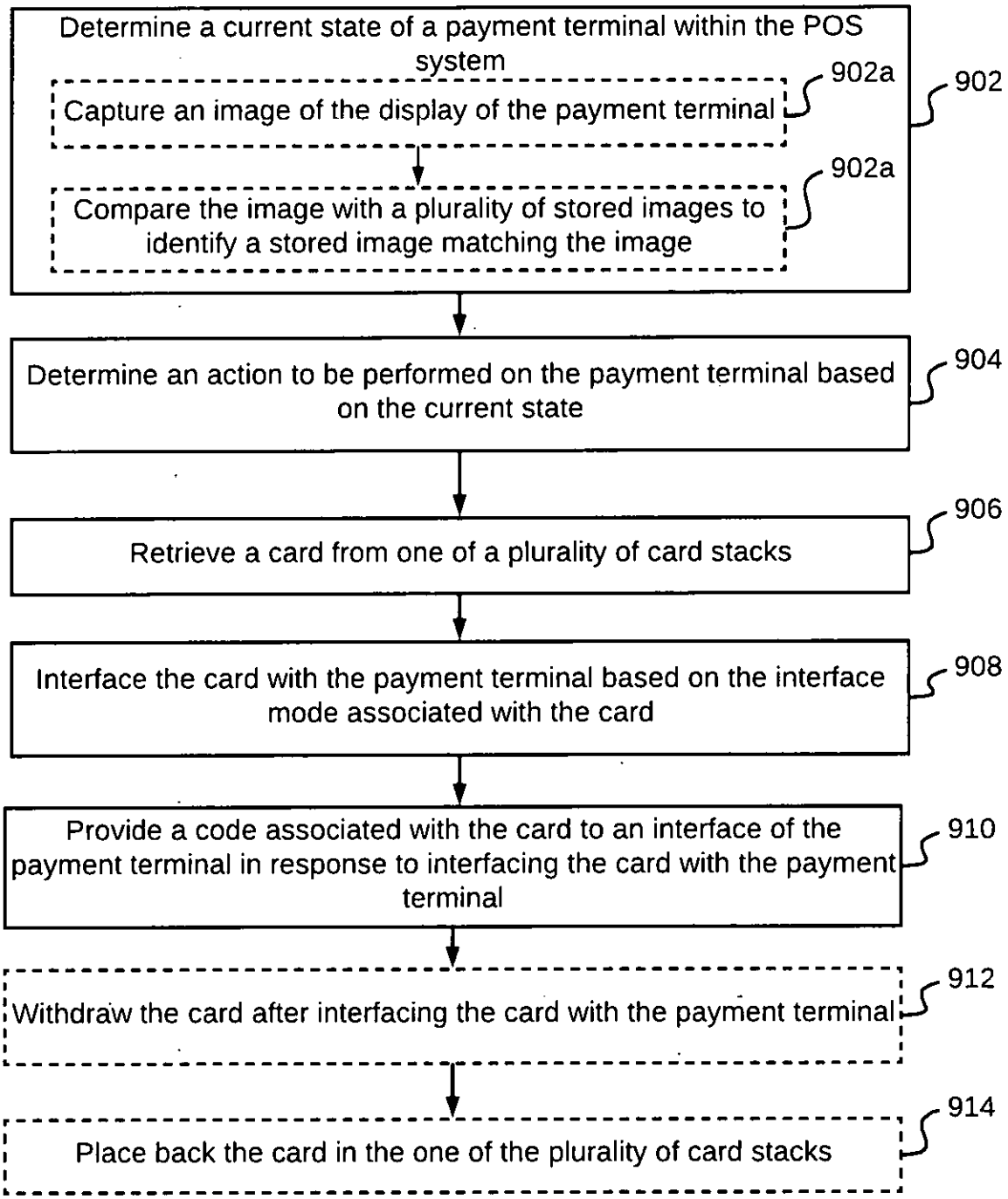

FIG. 9

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