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A CONTAINER FOR VALUABLES**Field of the Invention**

This invention relates to a container for valuables, particularly, but not exclusively, to a bank note cassette for use in an automatic teller machine (ATM).

Background to the Invention

Automatic teller machines are commonly used for dispensing bank notes to bank customers. Such machines are supplied with a quantity of bank notes in a replenishable container known as a bank note cassette. Such a cassette is filled with bank notes at a central location such as a strong room. The cassette is then placed in an armoured van and driven to the destination bank where it is unloaded and inserted into the automatic teller machine. The journey of the full cassette from the strong room to the ATM is termed "Cash in Transit" (CIT) and it is during such journeys that the cassette is most vulnerable to robbery.

The contents of such a cassette are difficult to protect, as the cassette needs to have an opening to allow notes to be dispensed from the cassette when in the ATM and is also required to be easily replenishable, thus having a removable lid. The cassette thus cannot be completely sealed and, typically, such cassettes are provided without any protection against tampering. The bank, therefore, relies entirely on the vigilance and honesty of its security guards in preventing robbery of such cassettes when in transit.

Proposals have been made to address this problem, for example in US patents US 4,363,279, US 5,053,748 and US 5,732,638.

In US 4,363,279, a cassette having two kinds of sensors to determine if tampering has occurred is provided, the first being to determine if the cassette has been opened in an authorized way and the second being a temperature sensor. If either detects an abnormal condition, a die canister is ruptured which indelibly marks the notes. In US 5,053,748, a cassette includes a counter which determines how many times the cassette is opened so that unauthorized access to the cassette can

5 be determined. In US 5,732,638, an ink reservoir is pressurized by a removal gas reservoir which is actuated in response to a detection system.

It is a disadvantage of these proposals that they are inflexible, relying on the same sensors and the same security devices in all situations. Since the nature of protection required during cash in transit and when in the ATM machine are
10 necessarily different, these proposals, therefore, do not optimally protect the currency cassette and its contents.

It is an object of the invention, to provide a container for valuables and more particularly a bank note cassette which alleviates this problem.

It is another object of the invention in a separate aspect to provide a container for
15 valuables having a novel sensor.

Summary of the Invention

According to the invention in the first aspect there is provided a container for valuables comprising:

20 at least one first sensor;
at least one second sensor; at least one security device; and control means arranged to be selectively responsive to the first or to the second sensor to actuate the security device when an abnormal condition is sensed.

25 Preferably, the container includes first and second security devices, the actuation of the security devices being selectable by the control means.

Most preferably, the first sensor and first security device are arranged to be used together and the second sensor and second security device are arranged to be used together.

30 The control means is preferably responsive to a user-actuated sensor, preferably for sensing a key or token carried by the user. The control means preferably counts the number of times the use of the key or token is sensed by the sensor, the response of the control means being dependent on that number.

According to the invention in a second aspect there is provided a container for
35 valuables having a plurality of sensors and at least one security device actuatable in response to an abnormal condition being sensed by a said sensor, and means

- 5 for inhibiting actuation of the security device in response to one or more selected sensors dependent upon the situation of the cassette.

Preferably, the sensing means is responsive to a sensor for a key or token carried by a user, with a number of times the sensor senses the key or token being an indication of the situation of the cassette.

- 10 According to the invention in the third aspect there is provided a container for valuables having a handle movable between a stowed position and a transit position, a sensor to monitor the position of the handle and control means responsive to the sensor to actuate a security device.

- Preferably, means are provided for inhibiting actuation of the security device in
15 response to sensing the movement of the handle which may comprise a sensor responsive to a key or token provided by the user.

- Most preferably the handle has a shaft rotatable therewith relative to a body portion of the container, the sensor being connected to the body portion and arranged to follow the profile of the shaft as the shaft rotates, the shaft having a
20 profiled portion to provide movement of the sensor between a first sensed position when the handle is in the stowed position and a second sensed position when the handle is in the transit position.

The profiled portion may be substantially cylindrical, having a flat or a protrusion at one or other of the sensed positions.

- 25 According to the invention in a fourth aspect there is provided a container for valuables having an opening for dispensing valuables from the cassette, a shutter movable to cover or open the opening, a sensor arranged to monitor the position of the shutter and control means responsive to the sensor to actuate a security device.

- 30 Preferably, the container further comprises means for selectively inhibiting actuation of the security device.

Most preferably the sensor comprises a microswitch which is actuatable by the shutter when in an open or closed position.

- The container may further comprise a further sensor arranged to detect
35 unauthorized entry to the cassette through the shutter opening and the further

5 sensor may comprise an emitter of electromagnetic radiation and a detector disposed across said opening.

According to the invention in a fifth aspect, there is provided a container for valuables having a body portion, a cover and a catch securing the body portion to the cover, the catch being movable between an open position and a secured
10 position, a sensor arranged to monitor the position of the catch and control means responsive to the sensor to actuate the security device.

Preferably, the sensor comprises a micro-switch disposed inside the container and the member passing through the cassette to be engageable with the catch and being movable between a first position, when the catch is secured, to switch the
15 micro-switch to a first state and a second position, when the catch is open, to switch the micro-switch to a second state.

According to the invention in the sixth aspect there is provided a method of protecting a container of valuables during a journey from a strong room or other secure location to an automatic teller machine, the cassette having a plurality of
20 sensors and at least one security device, the method comprising the steps of:

- a) at the secure location, enabling a first sensor of the plurality of sensors whereby the security device is actuated when an abnormal condition is sensed by the first sensor; and
- b) upon placement of the cassette in the automatic teller machine enabling a
25 second sensor of the plurality of sensors to actuate the security device when an abnormal condition is sensed by the second sensor; whereby the cassette is protected by the first sensor during a cash in transit operation from the secure location to the automatic teller machine and by the second sensor when in the automatic teller machine.

30 Preferably, the cassette has at least two first sensors and at least two second sensors, one sensor being common to the first sensors and second sensors.

In the described embodiment, a bank note cassette for use in an automatic teller machine is disclosed. The cassette is provided with a plurality of sensors and a plurality of security devices. A central controller is responsive to the sensors for
35 actuating the security devices depending upon where the central controller

5 considers the cassette to be. The whole cassette has an independent internal power supply and is thus stand-alone.

The cassette is provided with a carrying handle for moving the cassette from one location to another. This handle is movable between two positions for storage and for transit and can only be moved between these positions when a key, in the particular case of the described embodiment, an electronic card key, is inserted
10 into a reader in the cassette. The number of times that the card is read, to allow movement of the handle, is monitored, this being directly related to the situation or location of the cassette, since in the normal course of events, the handle should only have to change position four times, on leaving the strong room, on being
15 placed in the van for transit to the bank, for removal from the van and for insertion into the ATM.

In dependence of this count, the controller will then be responsive to selected sensors applicable to that situation. For example, when in transit, the controller can inhibit a level sensor monitoring for disturbance of the cassette (which would
20 only be usable in an ATM), relying on sensors to determine if the cassette has been opened and a smoke dye canister for colouring the notes as 10 a security device. Similarly, in the ATM, where it is forbidden to use a smoke dye canister, this is inhibited and the level sensor enabled. Furthermore, if the handle is moved without insertion of the key, the currently enabled security devices are
25 immediately actuated.

Consequently, the controller is able to enable/disable sensors and security devices appropriate to different situations in which the cassette might be placed thus providing a flexible means of protecting the cassette in various situations.

30 **Brief Description of the Drawings**

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a three dimensional view of a currency cassette.

Figure 2 is a plan view of the cassette of Fig. 1 with the cover removed.

35 Figure 3 is across-sectional view across X-X of Figure 2.

5 Figure 4 is a block diagram of the sensors and security devices of the embodiments of Figs. 1 - 3.

Figures 5A and 5B are diagrams showing operation of a first variation of a handle switch of the embodiments of Figs. 1 to 4;

Figures 6A and 6B are schematic diagrams of the operation of a second 5
10 variation of handle switch of the embodiments of Figs. 1 to 4.

Figure 7 is a side view of the cassette lid catch and associated sensor in an opened position;

Figure 8 is a view similar to Fig. 7 showing the catch and sensor in a closed position;

15 Figure 9 is a view of the rear of the cassette showing the bank dispensing opening and path open shutter; and

Figure 10 illustrates the circuit arrangement of a shutter sensor.

Detailed description of the preferred embodiment

The embodiment to be described is based on a standard NCR ATM currency
20 cassette. The currency cassette is schematically shown in Fig. 1, the cassette comprising a body portion 10 having a lid 12. The lid is provided with elongate bank note guide members 12a 12b and is connected to the body portion 10 by a catch at one end and hinge connectors 13 at the other. A bank note 25 dispensing opening 15 is covered by a shutter 15a (Fig. 9) which is automatically opened
25 when the cassette is inserted into the ATM. The body portion is provided with a handle 16 movable between a stowed position (shown in full lines) and a perpendicular transit position (shown in phantom lines). The handle 16 is connected to the body 10 by means of cylindrical stub shafts which rotate in corresponding openings in body 10.

30 The cassette is provided with a security system having a plurality of sensors and the plurality of security devices which are shown schematically in Fig. 4 with their physical positions being shown in Figs. 1 to 3 and which are connected to a central controller 50, as follows:

Sensors

- 5 1) Four position sensors 52. Each position sensor 52 is in the form of a micro switch positioned between the body 10 and cover 12 and senses if the cover is in position on body 10 or not.
- 2) Level sensor 54 determines the attitude of the sensor. The level sensor 54 is a commercial component and preferably calibrated to sense if the attitude of the cassette changes by more than 45°.
- 10 3) Handle sensor 56 determines if the handle has been moved from the stowed to the transit position or vice versa. The handle sensor 56 is a micro switch actuated in response to movement of the handle shaft (as described below).
- 4) Catch sensor 58 to determine if the cover catch 14 is opened or not. This is in the form of a micro switch which opens if the catch is opened.
- 15 5) Micro-switch 59c to determine if the shutter 1 5a is open or not.
- 6) Coded sensors 59a, 59b to detect any unauthorized entry into the cassette through the shutter opening. This may be by use of infra-red, or any other electromagnetic wave, or by use of high frequency, or ultrahigh frequency, sonics.
- 20

Security Devices

- 1) An audible alarm 60.
- 2) A coloured smoke die cartridge 62; and
- 3) An explosive liquid security ink die cartridge 64.
- 25 The central controller 50 is further connected to a user-actuated sensor 70 in the form of a lock for a key or a reader for a token 72 inserted by the user. In the present embodiment, the sensor 70 is a key card reader, preferably a Dialogue card reader.

All components are powered by two rechargeable batteries 80, 82.

- 30 A central area 79 in the cassette between a rear wall 84, a movable pusher 86 and a track 87 of body portion 10 and the guide members 12a, 12b of lid 12 can receive a stack of bank notes. The pusher 86 runs on the track 87 and a spring mechanism (not shown) is provided to bias pusher 86 and the stack of banknotes in the cassette towards rear wall 84 and the location of the bank note dispensing opening 15.
- 35

5 As shown in Fig. 2, most of the sensors and security devices are provided in a region between the pusher 86 and front of the container, which space is unused in the conventional NCR cassette. The ink canister 64, batteries 80, 82 and central controller 50 are disposed in the lid 12 although they may be located at any suitable location in body 10. They are connected by flexible electrical connections
10 at hinge connectors 13 to security system components in the main body 10. The sensors 52 are disposed above the level of the notes in the cassette. Thus, all the sensors, security devices and other components may be positioned in the cassette in the manner which does not affect the primary purposes of the cassette namely containing and dispensing bank notes.

15 The handle sensor 56 is shown in more detail in Figs. 5 and 6 and comprises a micro switch 90 which has an outwardly biased member 92 which acts like a so cam-follower on the handle shaft. A portion of the handle shaft adjacent the micro switch 90 is arranged to be non-circular in shape. In the first variation shown in Fig. 5, a flat 94 is placed on one side of the shaft. In a second variation shown in
20 Fig. 6, a cam-like protrusion 96 is provided.

The size of the flat 94 or protrusion 96 is such that if the handle is moved to 90 degrees from the stowed position of the handle, illustrated in Figs. 5A and, 6A to the transit position of the handle, shown in Figs. 5B and 6B, the micro switch biased member 92 moves from a first sensed position to a second sensed position.

25 Thus, the sensor can sense a change in position of the handle.

The catch sensor 58 is shown in more detail in Figs. 7 and 8. The catch, formed from plastics material comprises a cassette body base member 100 connected to the cassette body 10 by supports 102. A catch member 104 is connected to the body portion 100 by a living hinge 106. A lug 108 protrudes from the body
30 portion 100 and is received in an opening 110 in the catch member 114 when in a closed position as shown in Fig. 8. The cover 12 has connected thereto a cover base member 114 via supports 116. A lug 118 protrudes from the base member 114 and is arranged to be received in an opening 120 when the catch member is in a closed position shown in Fig. 8, so that the catch member 120 holds the cover
35 12 and to the cassette body 10. Base member 100 is provided with a cylindrical bore 120 which receives a pin member 124. A pin member 124 is provided with,

5 at one end, a head 126 and, at the other end, a stop member 128 connected by cylindrical shaft 127. A spring 130 is held captive between head 126 and stop member 128. Pin member 124 is further received in a bore 132 formed in cassette body 10 so that pin 124 protrudes through the casing 10 to the inside of the cassette body where stop member 128 is disposed.

10 A micro-switch 134 is mounted in a casing 136 connected to body portion 10. The micro-switch 134 is electrically connected to CPU 50 and has a switch member 138 mounted for pivotal movement and biased in the direction of arrow A of Fig. 7.

With the catch member 104 open, as shown in Fig. 7, spring 130 biases pin member 124 to an open position and switch member 138 adopts a position shown
15 in Fig. 7 in which it abuts against member 128. When catch member 104 is closed as shown in Fig. 8, pin member 124 is forced inwardly against the bias of spring 130, with stop member 128 forcing switch member 138 towards the body of switch 134. The two positions of switch member 138 shown in Figs. 7 and 8
20 change the state of the micro-switch 134, so that the CPU 50 can determine if the catch member 104 is open or closed.

The shutter sensor is shown in more detail in Figs. 9 and 10. The shutter 15a of a NCR cassette is normally locked closed but is opened by plungers forming part of the ATM being inserted into openings 150 in the body 10. The plungers actuate a
25 mechanical mechanism (not shown) lowering the shutter 15a which slides into a compartment 15b below the track 87 to open opening 15 so that bank notes may be dispensed.

Microswitch 59c is disposed in the compartment 15b at a position to be 15 switched from one state to another by engagement with the end of the shutter 15a when fully lowered. The microswitch 59c is directly connected to controller 50.
30

Sensor 59a, 59b comprises an emitter 59a and a corresponding detector 59b disposed in corners of the body portion 10 to face each other across the opening 15 behind the shutter 15a. As shown in Fig. 10, the emitter 59a and detector 59b are electrically connected to an encoder/decoder 152 which is in turn connected to
35 CPU 50. In use, emitter 59a sends an infra-red beam which is detected by detector 59b and this signal is sent via encoder/decoder 152 to controller 50. When

5 anything lies in the path between emitter 59a and detector 59b (indicating an unauthorized attempt to access the cassette through opening 15), the detector 59b is occluded which is sensed by encoder/decoder 152 which sends a corresponding signal to controller 50.

Operation of the security system provided in the cassette will now be described.

10 The central controller 50 has the key combination from two key cards 72 which may be inserted into card reader 70. The first is a master key card, which never leaves the strong room and is used to disable all security functions of the cassette when inserted and also to reset the transit key register (set to COUNT 0). The second key is a transit key and this key is carried by the security personnel
15 carrying the cassette from the strong room to the ATM in the bank. The specific purposes of the transit key are, firstly, to allow the handle 56 to be moved between stowed and transit positions and secondly to give the central controller 50 an indication as the current situation of the cassette.

Assuming that the cassette has been filled with money, closed, and the master key
20 removed, the central processor controls the security system in accordance with the insertion of the transit key in accordance with the following:

- 1) When the transit key is first inserted, the central controller checks the switches 52 and lock switch 58 to ensure that the cover 12 is firmly in place on the body portion 10. All sensors except the level sensor 54 and the handle
25 switch 56 are enabled. All security devices are enabled. Prior to removal of the transit key, the operator moves the handle 16 to the transit position shown in phantom lines in Figs. 1 and 2. When the key is removed (COUNT 1), this position is sensed by the central controller and the handle switch 56 enabled. It is now possible for the operator to carry the currency cassette to an armored
30 van for transfer to the bank.
- 2) The cassette is then placed in the van in a horizontal rack. The key is re-inserted which disables the switch 56 allowing the handle to be moved back to the stowed position. After this, the key is removed (COUNT 2), enabling the switch 56 again.
- 35 3) On arrival at the bank, the key is re-inserted, switch 56 disabled and the handle moved to the transit position. The key is then removed enabling switch

- 5 56 (COUNT 3). The cassette is then removed from the rack and carried into the bank where it is placed in the ATM machine.
- 4) The key is then re-inserted, deactivating switch 56 and the handle moved to the stowed position. Once the key has been removed (COUNT 4), the central controller enables the switch 56 and also the level sensor 54 and disables the sensors 59a, 59b, 59c (to allow the shutter to be opened and money dispensed) and smoke canister 62 since, at COUNT 4, the central controller assumes that the cassette must be in the ATM.
- 10 5) Once the cassette is empty, the key is inserted to allow the handle to be raised (to remove the cassette). Once the key is removed (COUNT 5), the level sensor is disabled to allow the cassette to be moved to the armoured van and the smoke dye cartridge and sensors 59a, 59b, 59c enabled.
- 15 6) The cassette is placed in the horizontal rack of the van and the key inserted to allow the handle to be placed in the stowed position. The key is then removed (COUNT 6).
- 20 7) The key is inserted again when once the van is back at the strong room location to allow the handle to be moved to the transit position. The key is removed (COUNT 7) and the cassette removed from the van.
- 8) When the cassette has been moved to the strongroom, the key is inserted for the last time to allow the handle to be moved to the stowed position (COUNT 8). At this point the master key can be reinserted to reset all the registers and disable the sensors and security systems.
- 25

Two timer related functions are provided by the central processor. When the handle is in the transit position, an operator is only able to hold the handle for about 10 minutes after which the central controller assumes there is a problem and actuates the currently enabled security devices. The currently enabled security devices also can be actuated if the cassette has not been returned to the strong room (COUNT 8) within a week or other abnormally long time frame, or if the battery reaches a predetermined low level of charge below which the central controller may not be able to actuate the security devices.

30

5 The embodiment of the invention described is not to be construed as limitative. For example any combination of sensors and/or security devices may be used including other kinds of sensors such as, for example

- (1) a temperature sensor;
- (2) a cassette integrity sensor such as a web of wires surrounding the inside of a
10 cassette, breaking of any wire, for example by attempting to cut into the lid or body portion directly, being sensed by the CPU;
- (3) other means for sensing the open or closed state of the shutter, such as a micro-switch or an emitter and detector using another frequency in the electromagnetic spectrum, such as to a coded pulse photo-link system using a
15 light source and a light dependent resistor, and other kinds of security devices for example a visual or radio connected remote alarm device.

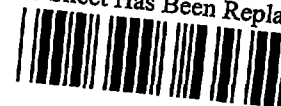
The user-actuated sensor may be of any suitable form and need not require a separate key or token, for example a combination lock requiring a code or combination to be entered by the user or a biometrics sensor relying on biometrics
20 of the user such as a fingerprint scanner may be used before and after movement of the handle, to replace the steps of inserting and removing (or swiping) the key/token.

The described embodiment can also be applied to containers for valuables other than a bank note cassette, such as a safe deposit box, cash box, briefcase or
25 suchlike.

5 CLAIMS

1. A container for valuables including:
at least one first sensor;
at least one second sensor;
at least one security device; and
- 10 control means arranged to be selectively responsive to the first or to the second sensor to actuate the security device when an abnormal condition is sensed.
2. A container as claimed in claim 1, including first and second security devices, the actuation of the security devices being selectable by the control means.
- 15 3. A container as claimed in claim 2, wherein the first sensor and first security device are arranged to be used together and the second sensor and second security device are arranged to be used together.
4. A container as claimed in any one of the preceding claims, wherein the control means is responsive to a user-actuated sensor to select the first or
- 20 second sensor.
5. A container as claimed in claim 4 as dependent on claim 2 or claim 3, wherein the control means is responsive to the user-actuated sensor to select the first or second security device.
6. A container as claimed in claim 4 or claim 5, wherein the user-actuated sensor
- 25 is arranged to sense a key or token input by a user.
7. A container as claimed in any one of claims 4 to 6, wherein the control means is arranged to count the number of times the user actuated sensor is actuated by the user, the response of the control means being dependent on that number.
- 30 8. A container as claimed in any one of the preceding claims, further including a handle and a handle sensor arranged to sense if the handle is in a transit or a stowed position, the handle being able to be used to carry the container when in the transit position but not when in the stowed position.
9. A container as claimed in claim 8 as dependent on claim 4 or any claim
- 35 dependent thereon, wherein the handle is only movable between said positions when the user actuated sensor senses a user actuation.

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- 5 10. A container for valuables having a plurality of sensors and at least one security device actuatable in response to an abnormal condition being sensed by a said sensor, and means for inhibiting actuation of the security device in response to one or more selected sensors in dependence upon the situation of the container.
- 10 11. A container as claimed in claim 10, wherein the sensing means is responsive to a user-actuated sensor with a number of times the sensor senses actuation by the user being an indication of the situation of the container.
12. A container as claimed in claim 11, further including a handle and a handle sensor arranged to sense if the handle is in a transit or a stowed position, the
15 handle being able to be used to carry the container when in the transit position but not when in the stowed position and wherein the handle is only movable between said positions when the user-actuated sensor senses a user actuation.
13. A container for valuables having a handle movable between a stowed position and a transit position, a sensor arranged to monitor the position of the handle
20 and control means responsive to the sensor to actuate a security device.
14. A container as claimed in claim 13, further including means for inhibiting actuation of the security device in response to sensing movement of the handle.
15. A container as claimed in claim 14, wherein the inhibiting means includes a
25 sensor responsive to actuation by a user.
16. A container as claimed in any one of claims 13 to 15, wherein the handle has a shaft rotatable therewith relative to a body portion of the container, the sensor being connected to the body portion and arranged to follow the profile of the shaft as the shaft rotates, the shaft having a profiled portion to provide
30 movement of the sensor between a first sensed position when the handle is in the stowed position and a second sensed position when the handle is in the transit position.
17. A container as claimed in claim 16, wherein the profiled portion is substantially cylindrical, having a flat or a protrusion at one or other of the
35 sensed positions.

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- 5 18. A container for valuables having an opening for dispensing valuables from the cassette, a shutter movable to cover or open the opening, a sensor arranged to monitor the position of the shutter and control means responsive to the sensor to actuate a security device.
- 10 19. A container as claimed in claim 18, further including means for selectively inhibiting actuation of the security device.
20. A container as claimed in claim 18 or 19, wherein the sensor includes a microswitch which is actuatable by the shutter when in an open or closed position.
- 15 21. A container as claimed in any one of claims 18 to 20, further including a further sensor arranged to detect unauthorized entry to the cassette through the shutter opening.
22. A container as claimed in claim 21, wherein the further sensor includes an emitter of electromagnetic radiation and a detector disposed across said opening.
- 20 23. A container for valuables having a body portion, a cover and a catch securing the body portion to the cover, the catch being movable between an open position and a secured position, a sensor arranged to monitor the position of the catch and control means responsive to the sensor to actuate the security device.
- 25 24. A container as claimed in claim 23, wherein the sensor includes a micro-switch disposed inside the container and the member passing through the cassette to be engageable with the catch and being movable between a position, when the catch is secured to switch the micro-switch to a first state and a second position, when the catch is open, to switch the micro-switch to a
- 30 second state.
25. A method of protecting a container of valuables during a journey from a strong room or other secure location to install an automatic teller machine, the cassette having a plurality of sensors and at least one security device, the method including the steps of:

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- 5 a) at the secure location, enabling a first sensor of the plurality of sensors whereby the security device is actuated when an abnormal condition is sensed by the first sensor; and
- b) upon placement of the cassette in the automatic teller machine, enabling a second sensor of the plurality of sensors to actuate the security device when
10 an abnormal condition is sensed by the second sensor; whereby the cassette is protected by the first sensor during a cash in transit operation from the secure location to the automatic teller machine and by the second sensor when in the automatic teller machine.
26. A method as claimed in claim 25, wherein the cassette has at least two first
15 sensors and at least two second sensors, one sensor being common to the first sensors and second sensors.



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