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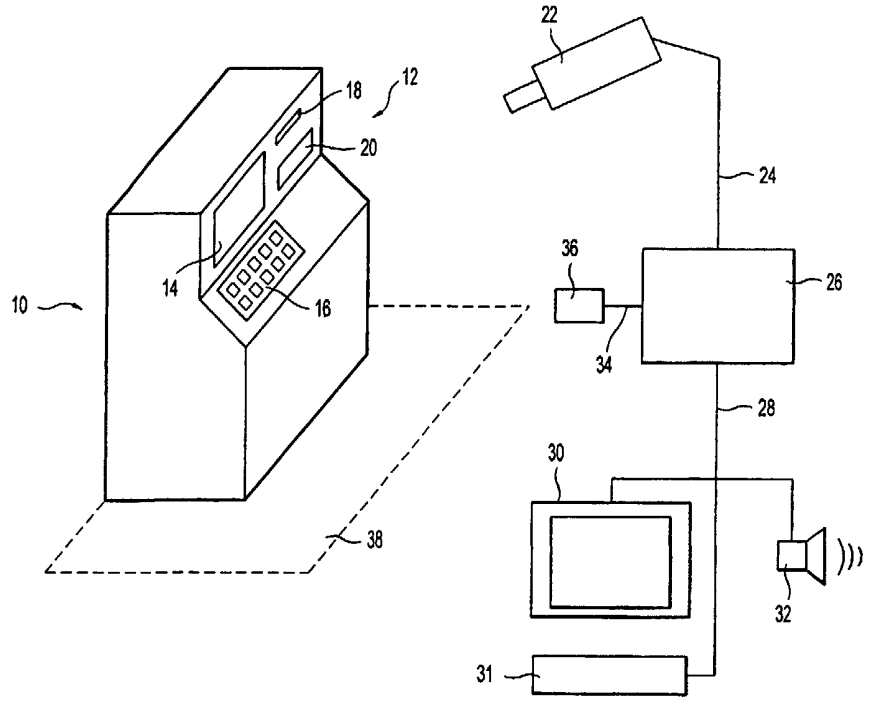
(54) Abstract Title
Protecting self-service automatic machine using video camera

(57) In order to protect self-service automatic devices, in particular automatic cash dispensers and suchlike, against manipulations at the operator interface 12 of the same, the operator interface 12 of the apparatus to be monitored is recorded by means of a video camera 22 and the recorded current image is compared with a reference image which reproduces the operator interface 12 at an initialisation instant. In order to do this, the signal output of the video camera 22 is connected to a data-processing device 26, which has a memory for storing at least one reference image of the operator interface 12 and a comparator for comparing a current image with the reference image.



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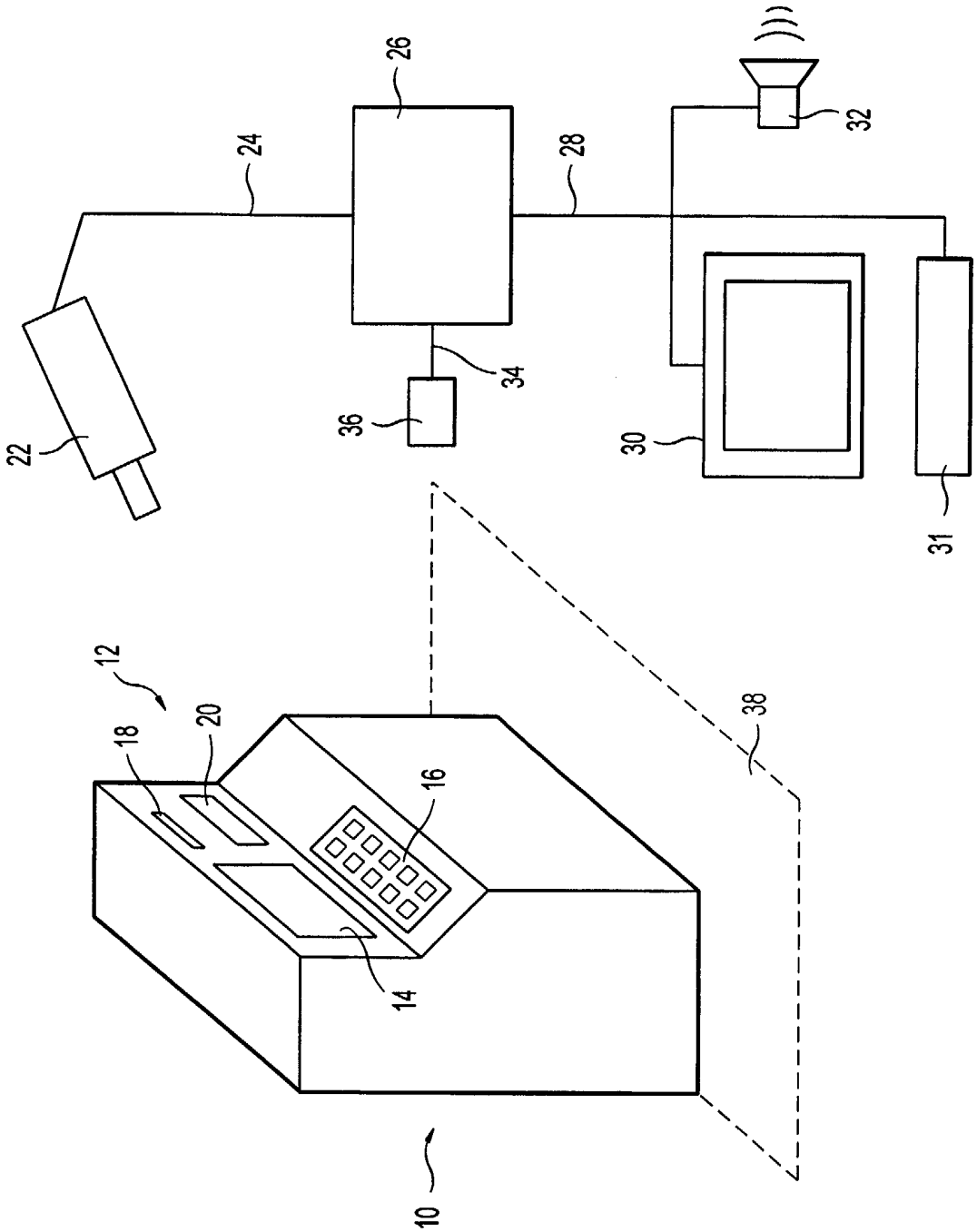
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.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METHOD AND APPARATUS FOR PROTECTING SELF-SERVICE AUTOMATIC MACHINES

The present invention relates to a method and apparatus for protecting self-service automatic machines, in particular automatic cash dispensers and suchlike, against manipulations (tampering) at the operator interface of the same.

Self-service automatic machines, in particular those which are provided for cash-value transactions, such as automatic cash dispensers, automatic cash safes, ticket terminals and suchlike, can, with intent to deceive, be reorganised by so-called fore-parts (false fronts) or "Trojan horses" in such a way that the intended issue of tickets or assets does not take place to the authorised user but is instead diverted to an unauthorised third party. Likewise, fore-parts are known which are designed to allow the gaining of possession of identification cards or customer cards in an unauthorised way. Dummy interfaces are also known which allow a person's secret "pin-number" to be acquired. Fore-parts of this type can also be used only to determine the data content of identification cards.

All of these criminal attacks on self-service automatic machines have in common the fact that the fore-parts or dummies which are typically put on, do not intervene in the actual functional sequence of the automatic machine or disrupt its operational sequence. Instead they but prevent or influence the access of the authorised customer to the money slot, ticket slot or card slot or to the keyboard. Because, as a rule, these fore-parts do not intervene in the actual operational sequence of the automatic machine or alter said operational sequence, such manipulations are difficult for the automatic-machine sequencing control to detect, or cannot be detected at all. Because the

shape, position, material or colour of such fore-parts is also not foreseeable, the detection of such false fronts with the aid of sensor technology mounted in the automatic machine would have little success or would require a considerable technical expenditure.

The essence of the present invention is to provide a method and an arrangement of the type mentioned in the introduction which allows manipulations at the control panel of a self-service automatic machine to be recognised rapidly and reliably, without the automatic machine itself having to be substantially altered for this purpose.

According to one aspect of the present invention, there is provided a method for protecting self-service automatic machines, such as cash dispensers, against manipulations at the operator interface of the same, wherein the operator interface of the automatic machine is recorded by means of a video camera, and in that the current images which are recorded by the video camera are compared with a reference image which represents the operator interface at an initialisation instant.

According to another aspect of the present invention, there is provided an apparatus for protecting self-service automatic machines against manipulations at the operator interface of the same, the apparatus comprising a video camera which can be adjusted to monitor the operator interface of the automatic machine, wherein the signal output of the video camera is connected to a data-processing device which has a memory for storing at least one reference image of the operator interface, and a comparator for comparing a current image with the reference image.

The present invention preferably allows lasting alterations at the operator interface of the self-service automatic machine to be detected quickly and to take suitable measures to prevent damage to customers.

In order to be able to automate the method, it is advantageous if the respective current image is digitised and, by means of a data-processing device, compared with the reference image stored in digitised form. This data-processing device can be an independent computer, which can, for example, also be connected to a plurality of such cameras. However, there is also the possibility of letting the comparison be carried out by the control computer of the apparatus to be monitored.

Advantageously, the presence of a person inside a predetermined space around the apparatus to be monitored is detected and the image comparison carried out in each case only at the times at which there is no one inside the predetermined space or no operating contact. In this way, it is ensured that the current image is not disturbed by people. At the same time, for example, the control computer is also available for the image comparison at these times, because it is not required for the control of the operating sequences of the self-service automatic machine. Furthermore, in the case of this action, it is ensured, for example, that pin numbers of the customers are not spied out as a result of the monitoring.

If differences which exceed a predetermined extent occur during the image comparison, an alarm is triggered and/or the apparatus to be monitored is blocked to customer operation. There is thus the possibility of checking whether manipulations have been carried out before a customer can be damaged.

Another possibility for the analysis consists in that, in the case of a continuous recording of the operator interface and a constant comparison with the reference image, image alterations which take place as a result of a customer operation are suppressed for an adjustable time, and that when the time which has been

set is exceeded, real-time images are transmitted to a play-back unit and/or to a video recorder at a monitoring centre. Here, a supervisor can then establish whether manipulations have possibly taken place or whether the lasting image alteration is based only on the fact that a customer has left an object on the control panel, for example. A video recording further makes it possible to identify the person who has carried out a manipulation.

Preferably, a plurality of reference images are stored, which images were recorded under different light ratios. There is thus the possibility of bringing in a further reference image if differences crop up and thus avoiding false alarms which are based only on changing daylight ratios.

In order to simplify the image comparison, reference areas can be marked in the reference image of the operator interface.

The apparatus in accordance with the invention described in claim 10 for carrying out the method described above can be connected to a display device or alarm device which can be triggered as a function of differences between the images to be compared that are established by the comparison. In this connection, the display device can also be a monitor, for example, which is set up in a monitoring room and allows a supervisor to observe real-time images of the operator interface in order to recognise possible manipulations.

In order to be able to establish whether people are in the vicinity of the self-service automatic machine or an operating process is running, the data-processing device can be connected to a sensor device for detecting the presence of people in a predetermined space around the apparatus to be monitored. Such a sensor device can have a movement indicator, an IR sensor, a light barrier or suchlike. A contact mat can

also be placed in front of the apparatus to be monitored, which contact mat responds to the weight of a person.

Instead of such a sensor device, a program can also be provided in the data-processing device, which program responds directly to movements in the image delivered by the video camera, i.e. recognises states of motion and, for the image comparison, analyses only current images in which there is no movement.

For a better understanding of the present invention, and to show how the same may be carried into effect, reference will now be made, by way of example to the accompanying drawings, in which:-

Fig. 1 shows an apparatus for monitoring an automatic cash dispenser

The Figure shows an automatic cash dispenser, denoted generally by 10, having an operator interface 12. The latter comprises a display screen 14, an input keyboard 16, a card slot 18 and a money dispensing compartment 20. The money dispensing compartment 20 and the card slot 18 are particularly at risk of manipulations. However, the keyboard can also be manipulated in order to spy out the input of the secret numbers, for example.

A video camera 22 is arranged opposite the automatic cash dispenser 10 in such a way that it detects the entire operator interface 12 or at least the elements of the same that are at risk of manipulation. The signal output of the video camera 22 is connected by way of a line 24 to a data-processing device 26, which can be an independent computer or even, however, the control computer of the automatic cash dispenser 10. Stored in a memory of the data-processing device 26 is at least one reference image in digitised form, which shows the operator interface 12 at an initialisation instant, i.e. in a form which is

guaranteed not to be manipulated.

The data-processing device 26 is connected by way of a line 28 to a monitor 30, a video recorder 31 and an alarm device 32, which are arranged in a monitoring centre, for example. Furthermore, the data-processing device 26 is connected by way of a line 34 to a sensor 36, which monitors a predetermined space 38, indicated with dashed lines, around the automatic cash dispenser 10 for the presence of people. This sensor 36 can be a movement indicator, an IR sensor, a light barrier or suchlike. The current image delivered by the video camera 22 or a further video camera can also be analysed for the presence of a person. If, for example, the entire operator interface 12 is covered, it is to be assumed that this is being done by a person.

The data-processing device 26 compares a digitised image delivered by the video camera 22 with a stored reference image when this image shows no movement or when no movement indication comes from the sensor 36. If, during this comparison, differences are established between the current image and the reference image, which differences exceed a predetermined extent, an alarm is triggered at the alarm device 32, or the current image is transmitted to the monitor 30, so that a supervisor can check whether a manipulation or another unintentional disruption of the image is present.

An advantage of the solution which is described lies in that the monitoring arrangement requires no interventions at all in the apparatus to be monitored and therefore can also be retro-fitted in apparatus which are already in existence.

List of reference symbols

10	automatic cash dispenser
12	operator interface
14	display screen
16	input keyboard
18	card slot
20	money dispensing compartment
22	video camera
24	line
26	data-processing device
28	line
30	monitor
31	video recorder
32	alarm device
34	line
36	sensor
38	space

CLAIMS:

1. Method for protecting self-service automatic machines, against manipulations at the operator interface of the same, wherein the operator interface of the automatic machine is recorded by means of a video camera, and in that the current images which are recorded by the video camera are compared with a reference image which represents the operator interface at an initialisation instant.

2. Method according to claim 1, wherein the respective current image is digitised and, by means of a data-processing device, is compared with the reference image which is stored in digitised form.

3. Method according to claim 2, wherein the comparison is carried out by the control computer of the automatic machine.

4. Method according to any one of claims 1 to 3, wherein the operator interface is recorded continuously, in that the presence of a person inside a predetermined space around the apparatus to be monitored is detected, and in that the image comparison is carried out before and after a person enters the predetermined space.

5. Method according to any one of claims 1 to 4, wherein if differences of a certain extent between the current image and the reference image occur, an alarm is triggered and/or the apparatus to be monitored is blocked to customer operation.

6. Method according to any one of claims 1 to 4, wherein the image alterations which take place as a result of a customer operation are suppressed for a predetermined adjustable time, and in that when the predetermined time is exceeded, real-time images are transmitted to a play-back unit and/or to a video recorder at a monitoring centre.

7. Method according to any one of claims 1 to 6,

wherein a plurality of reference images are stored, which images were recorded under different light ratios.

8. Method according to any one of claims 1 to 7, wherein reference areas are marked in the reference image of the operator interface.

9. A method according to any one of claims 1 to 8, wherein the self-service automatic machine is a cash dispenser.

10. An apparatus for protecting self-service automatic machines against manipulations at the operator interface of the same, the apparatus comprising a video camera which can be adjusted to monitor the operator interface of the automatic machine, wherein the signal output of the video camera is connected to a data-processing device which has a memory for storing at least one reference image of the operator interface, and a comparator for comparing a current image with the reference image.

11. Apparatus according to claim 10, wherein the data-processing device is connected to a display device and/or to an alarm device which can be triggered as a function of differences between the images to be compared that are established by the comparison.

12. Apparatus according to claim 11, wherein the display device is an image play-back unit for representing the current video image.

13. Apparatus according to any one of claims 10 to 12, further comprising a sensor device connected to the data-processing device for detecting the presence of people in a predetermined space around the automatic machine.

14. Apparatus according to claim 13, wherein the sensor device has a movement indicator.

15. Apparatus according to claim 13, wherein the sensor device has an IR sensor.

16. Apparatus according to claim 13, wherein the sensor device has a light barrier.

17. Apparatus according to claim 13, wherein the sensor device has a contact mat placed in front of the apparatus to be monitored.

18. Apparatus according to claim 13, wherein the sensor device is the video camera or a further video camera.

19. Apparatus as claimed in any one of claims 10 to 18, wherein the self-service automatic machine is a cash dispenser.

20. Apparatus substantially as herein described with reference to the accompanying drawing.

Application No: GB 0104290.2 **Examiner:** Robert Price
Claims searched: 1-20 **Date of search:** 8 November 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): G4N (NFFV), G1A (AMZ), G4H(HTG)

Int Cl (Ed.7): G07G 3/00, G07F 7/00, G08B 15/00

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X,P	GB 2351585 A	(NCR) See page 1 lines 1+2, page 2 lines 5-15, page 3 lines 15-18, page 8 lines 1+2	1,2,5,7,9, 10,11,19
X,Y	JP 9147090 A	(TOPPAN) see WPI abstract accession No. 1997-355467 [33]	X:1,2,10 Y:3
Y	DE 19811433 A1	(MAKU) see WPI abstract accession No. 1999-562803 [48]	3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.