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(54) A vehicle entry/exit control system

(57) A vehicle entry/exit control system 10 comprises a camera 14 arranged to view the face of a driver and a computer which compares the viewed image of the driver with a store of images of authorised drivers to identify the driver. The details of a transaction conducted by the vehicle within the entry controlled area are then printed and the computer prints a facsimile of the drive'r signature or the facial image of the driver on the printed record of the transaction.

Other biometric sensing methods such as iris recognition, fingerprint or DNA analysis can be used.

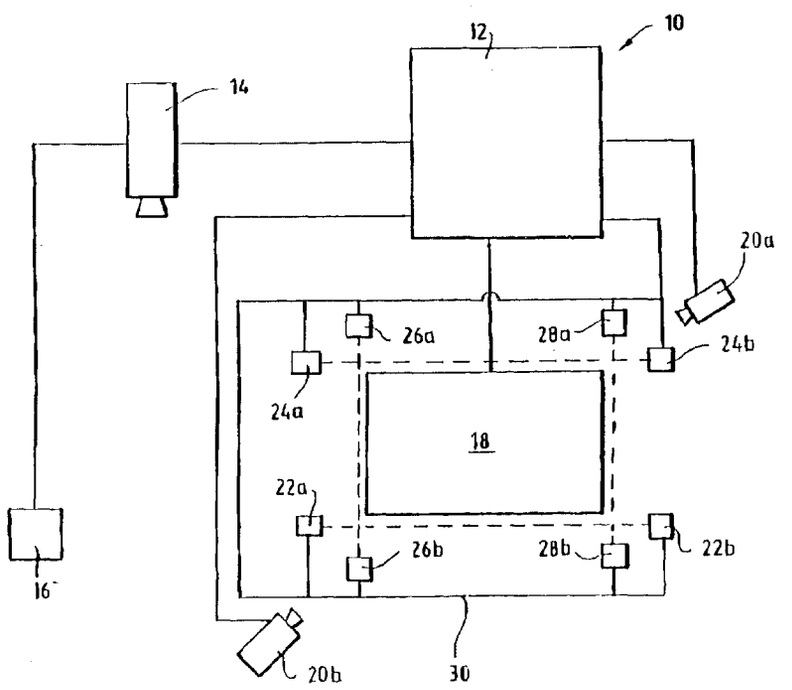

FIG.1

EP 0 962 894 A2

Description

[0001] The invention relates to a vehicle entry/exit control system particularly for vehicles entering a restricted site.

[0002] On waste disposal or transfer sites it is usually necessary for a vehicle depositing waste to be weighed at a weighbridge on entry to the site and on leaving the site in order to determine the amount of waste that has been deposited in order to levy a charge. In many waste disposal or transfer sites the entrance to the site is located some distance from the weighbridges which are located within the site. Accordingly, there is usually some time between the vehicle entering the site and the vehicle passing over the weighbridge. Also, the weighbridge can be by-passed by the vehicle driver or the weighbridge operator can allow the vehicle over the weighbridge without logging the weight in order to avoid payment of the charge for depositing the waste. One solution to that problem has been set out in our co-pending European Patent Application no.98300802.0. In that case, the vehicle is identified by a camera which films the registration plate of the vehicle and the registration is identified by optical character recognition software. The ensuing transaction is then associated with the vehicle so that any problem with the transaction can be referred back to the vehicle owner.

[0003] In some cases the transaction conducted needs to be confirmed by a signature and that causes delay as the driver must either leave his vehicle to provide the signature or the entry to the site must be manned. Thus each site entrance constitutes a significant investment in personnel.

[0004] It is an object of the present invention to provide an improved vehicle entry/exit control system.

[0005] According to the invention there is provided a vehicle entry/exit control system for controlling entry/exit of vehicles to a restricted area comprising biometric sensing means for sensing a physical or biological characteristic of a driver of a vehicle entering an area, a control unit which compares the sensed characteristic with a store of characteristics of authorised drivers to identify the driver of the vehicle and which associates the details of a transaction conducted by the vehicle within the aforesaid area with the driver of the vehicle and means for generating a facsimile of the signature or facial image of the driver on a record of a transaction conducted by the vehicle within the area.

[0006] In that way a log of vehicle transactions can be established and mistaken or fraudulent transactions can be identified and associated with the driver of a vehicle and a signature can be obtained with a substantially reduced delay to the driver of the vehicle. Also, the site entrance can be monitored remotely allowing multiple entrances to be manned from one remote site. This is of particular use to the aforementioned landfill sites where a daily log of vehicle entry and exit activity can be compared with a register of transactions to determine whether the transaction is correct. Incorrect or fraudulent transactions can then be associated with a particular driver and a confirmatory signature provided to support any contention.

[0007] The biometric sensing means may comprise a camera arranged to view the driver of a vehicle and image processing means such as a computer programmed with image processing software or equipped with image processing hardware. In that case the camera may be arranged to view the face of the driver. In another embodiment the biometric sensing means comprises an iris recognition device. Alternatively, the biometric sensing means comprises a palm or finger print reader. In yet another embodiment the biometric sensing means may comprise means for examining the DNA of the driver, such as from a sample of saliva.

[0008] In a preferred embodiment, the entry/exit control system is used in combination with a vehicle logging system of the type set out in our copending European patent application no. 98300802.0. In that way both the identity of the driver and the vehicle can be confirmed and associated with the transaction conducted.

[0009] A vehicle entry/exit control system in accordance with the invention will now be described in detail with reference to the accompanying drawings in which, Fig. 1 is a schematic diagram of a vehicle entry/exit control system in accordance with the invention.

[0010] In fig. 1 a vehicle entry/exit control system 10 comprises a control unit 12 in the form of a computer. The computer 12 is connected to a video camera 14 which is arranged to view the face of a driver of a vehicle entering a waste disposal site. The camera 14 is activated by a sensor 16 which is arranged to detect the passage of vehicles entering the site. The sensor could be a pressure pad, a passive infrared motion sensor or an induction loop. The image recorded by the camera 14 is recorded by image processing software in the computer 12 and the driver is identified by software which compares the image recorded by the camera with a store of images of authorised drivers. If the driver can not be identified, access to the site is refused and a remote operative is alerted so that a site operative can be dispatched to the entry point in order to check the identity of the driver. The system may include an override to allow authorised site personnel to admit vehicles subject to appropriate information and identification being provided by the driver. When the vehicle leaves the site the transaction that it has conducted is recorded and a facsimile of the signature of the driver is generated from a memory store in the computer on the transaction documentation. The transaction documentation may be a paper record or an electronically stored record. In the latter case, the record may be forwarded by e-mail to a stored address associated with the driver of the vehicle, such as the e-mail address of the company that employs the driver. In that way, an instantaneous notification of the transaction occurs which reduces delays in billing and in addressing problems with the transaction.

[0011] The system 10 can be associated with a weighbridge 18 at an entrance to the site. In that case the system further comprises a pair of cameras 20a, 20b arranged at diagonally opposing corners of the weighbridge 18 to film the registration plate of a vehicle at the weighbridge 18 and to confirm that the vehicle is correctly aligned on a weighbridge. Sensors are provided at the weighbridge to check further that the vehicle is correctly aligned on the weighbridge 18. In the embodiment illustrated in fig. 1 the sensors comprise light source and light detector pairs 22a, 22b, 24a, 24b, 26a, 26b and 28a, 28b. The light source and detector pairs are connected to a common bus 30 which carries the signals from the sensors to the computer 12. In the event that the vehicle is incorrectly aligned on the weighbridge 18, one of the light paths shown in dotted lines in fig. 1 between the respective light source and detector pairs will be broken. That will be registered by the computer 12 which will alert the weighbridge operator or remote site operative to the fact and also log the incorrect alignment in its memory. The weighbridge 18 will not be allowed to provide a measurement of weight until the vehicle is correctly aligned. In the event that the weighbridge provides an incorrect value for the weight of the vehicle for any reason the registration of the vehicle is logged by the cameras 20 so that the mistake can be corrected. Mistaken or potentially fraudulent transactions can be notified by the control unit 12 to a remote site (not shown). Operatives at the remote site can then determine the appropriate course of action.

[0012] Where a weighbridge operator is not required to process special waste documentation, a terminal will be provided to enable drivers to enter the waste type being carried, or the material type to be collected, and in the case of waste, the area from which the waste was collected. In the process of doing this, the driver will be identified by the system. All drivers will be pre-authorised by the credit holder for use with a particular vehicle or group of vehicles.

[0013] Provided that the driver is authorised for the vehicle, and the customer s credit status is satisfactory, the driver will be instructed to proceed to a supervised area. This will be the loading/unloading area for material/waste, respectively. The material loading/unloading supervisor will have a remote terminal and screen. In the case of a landfill, this will be the compactor driver. This instruction may be automatic, or require authorisation by site personnel, using the remote terminal, or conditional, based on the vehicle/driver or material type involved. In the preferred embodiment, the remote terminal will be connected to the weighbridge system by a microwave connection although a laser or other connection may be used. At the point of loading, the remote terminal will be used to confirm the material category. The operator using the remote terminal will be identified. The cameras used for the recognition of the driver at the weighbridge and the remote terminal operator will enable assistance to be provided to the former by the latter using video conferencing software.

[0014] After loading or unloading, the vehicle will return to the weighbridge to record the gross weight or net weight respectively. A terminal will confirm the driver's identity in the same manner as for the inbound weighing process and will produce a ticket for the driver bearing details of the transaction. This may be produced at the inbound weighing for incoming waste if stored tare weights are used. The identity of the driver and remote terminal operator involved will enable the terminal to print their signatures and names. Alternatively, the signatures may be printed from a light sensitive computer screen/light pen.

[0015] A further camera (not shown) can be provided at the exit of the site to ensure all of the vehicles that have entered the site during the day have left the site when the site closes.

[0016] As mentioned above, the system 10 could be used at a landfill site to control entry/exit of vehicles carrying waste. The system allows remote monitoring of vehicle entry to and exit from the site. It also reduces the possibility of a fraudulent transaction occurring and allows a record of the driver identity to be kept. When the vehicle has completed its task and dumped its load the documentation supporting the transaction can be generated with the driver s signature without the driver having to leave his vehicle.

[0017] The cameras could be video cameras, closed circuit television cameras or digital still cameras.

[0018] In another embodiment (not shown) the camera 14 is arranged to view the iris of a driver when the vehicle reaches a predetermined point. The driver looks closely at the camera which records an image of the drivers iris and passes the image to the computer for processing and comparison with the stored information regarding authorised drivers.

[0019] In a further embodiment (not shown) the camera 14 is replaced by a palm print reader. The driver of the vehicle pulls up alongside the reader and places his palm on the reader to allow the reader to scan his palm. Data from the palm reader is passed to the computer 12 to compare with the store of authorised driver information to allow identification of the driver.

[0020] Other methods of biometric identification such as fingerprints, voice pattern or DNA of the driver could be used. In the foregoing specification the term biometric is intended to encompass any physical or biological characteristic of the driver of a vehicle which can be used to identify the driver and which serves distinguishes the driver from unauthorised persons.

Claims

1. A vehicle entry/exit control system for controlling entry/exit of vehicles to a restricted area comprising biometric sensing means for sensing a physical or biological characteristic of a driver of a vehicle en-

tering an area, a control unit which compares the sensed characteristic with a store of characteristics of authorised drivers to identify the driver of the vehicle and which associates the details of a transaction conducted by the vehicle within the aforesaid area with the driver of the vehicle and means for generating a facsimile of the signature or facial image of the driver on a record of a transaction conducted by the vehicle within the area.

2. A vehicle entry/exit control system according to claim 1 in which the biometric sensing means comprises a camera arranged to view the driver of a vehicle and image processing means.

3. A vehicle entry/exit control system according to claim 2 in which the image processing means comprises a computer programmed with image processing software or equipped with image processing hardware.

4. A vehicle entry/exit control system according to claim 2 or 3 in which the camera is arranged to view the face of the driver.

5. A vehicle entry/exit control system according to claim 1 in which the biometric sensing means comprises an iris recognition device.

6. A vehicle entry/exit control system according to claim 1 in which the biometric sensing means comprises a palm or finger print reader.

7. A vehicle entry/exit control system according to claim 1 in which the biometric sensing means comprises means for examining the DNA of the driver.

8. A vehicle entry/exit control system according to any preceding claim in which a camera is provided for recording an image of the registration mark of the vehicle, and there is provided optical character recognition means for identifying the vehicle registration mark recorded by the camera, whereby the control unit associates details of a transaction conducted by the vehicle within the aforesaid area with the registration mark of the vehicle.

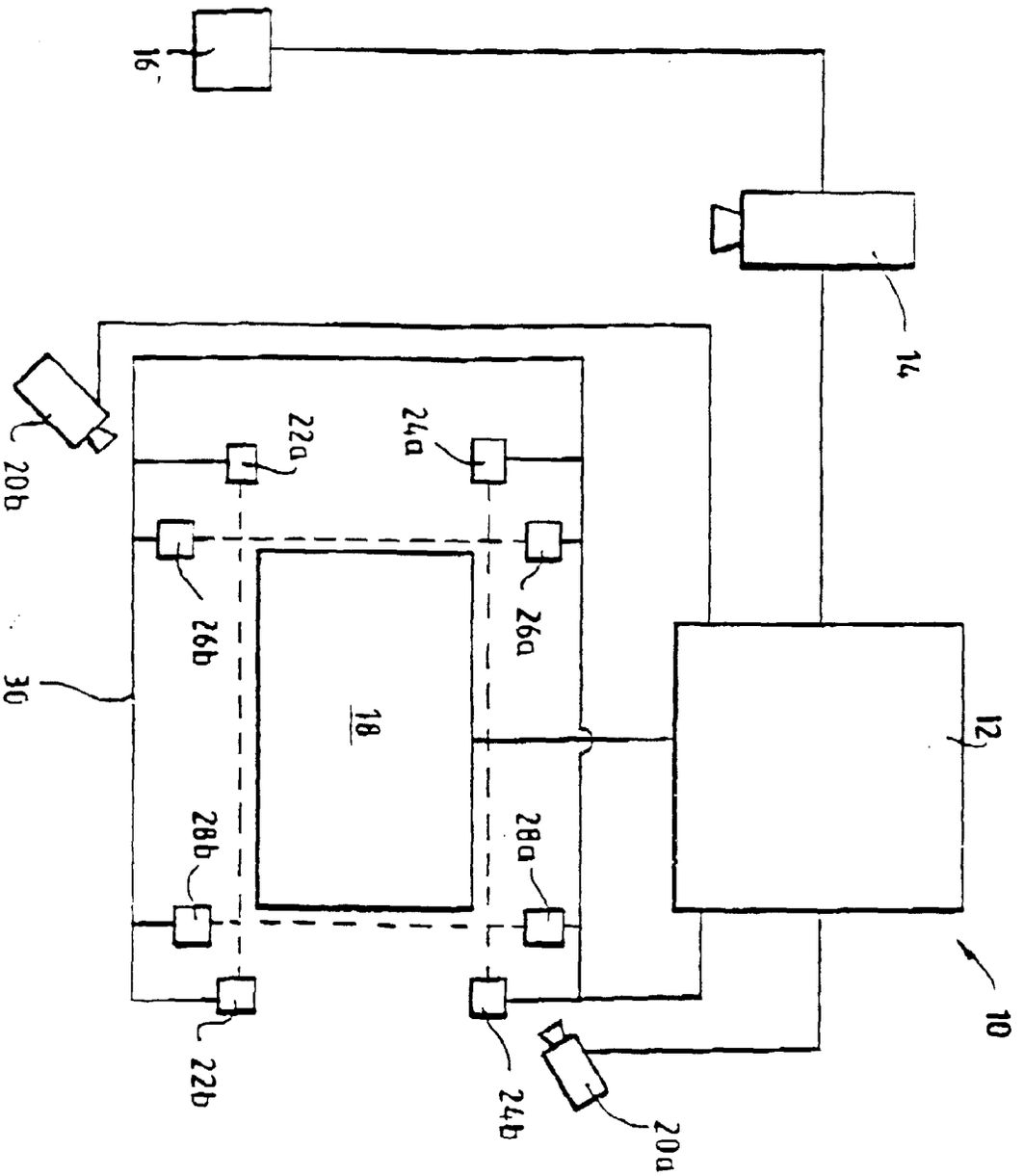

FIG. 1.