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(54) **Safety procedure and device for vehicle junctions**

Sicherheitsverfahren und -vorrichtung für Fahrzeugverbindungen

Procédure de sécurité et dispositif pour des jonctions de véhicule

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(56) References cited:
EP-A- 0 853 298
EP-A- 1 351 207
WO-A-00/46775
JP-A- 10 060 832
JP-A- 2001 101 566
US-A1- 2005 156 758

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Description

DESCRIPTION

[0001] The present invention relates to a safety procedure and device for vehicle junctions.

[0002] In particular, the present invention will be applicable to any vehicle junctions that cross a flow which is substantially perpendicular to the trajectory of the vehicle, such as junctions of parking areas across pedestrian routes, or of other types of junction with reduced visibility.

[0003] In said junctions there is the problem of preventing a vehicle from running over crossing pedestrians.

[0004] To solve said problem, systems are known that warn the pedestrian of the presence of a vehicle in the vicinity of vehicle junctions. However, these systems have various drawbacks. Firstly, pedestrians may be people of any physical condition, age or understanding of traffic, and said warnings of the presence of a vehicle may therefore not be perceived or heeded. Typically, a case of this type may involve a child who is moving along the pavement playing and/or at high speed. Other typical cases involve disabled and/or handicapped people, older people, etc., who have reduced ability to detect the vehicle and/or reduced ability to react to it. Secondly, said systems leave the driver of the vehicle without protection, in that the final responsibility for knocking down a pedestrian usually falls on him, even though he is unable to control the situation properly. In the case of junctions from parking areas with very long vehicles, there is always a "blind moment" when the driver places the front part of the vehicle in the trajectory of the pedestrians but does not know whether pedestrians are approaching the vehicle junction.

[0005] EP 1 351 207 does not refer to vehicle junctions of parking areas across pedestrian routes, but to pedestrian junctions across vehicle routes, where the vehicle velocity is relatively high and visibility of the driver is relatively good. It fails to give information to the driver apart from notifying the driver of a potential risk. The driver cannot evaluate the risk by himself. The warning signal is generated by mere presence, so that the warning signal is not reliable.

[0006] US 2005/0156758 A1 discloses a procedure according to the pre-characterising part of claim 1 and a system according to the pre-characterising part of claim 8 and refers to a vehicle junction of a parking area across a zone where pedestrians can cross, wherein the vehicle is circulating in reverse mode. The system gives images of the junction but not of its vicinity, so that the driver knows if a pedestrian is present in the junction, but has no clue whether there are pedestrians in the vicinity, going towards the junction, that interfere with the vehicle's trajectory when it is in the junction.

[0007] To overcome the aforementioned drawbacks, the present invention consists of a procedure and a device for producing significant safety characteristics at vehicle entrances and exits, facilitating manoeuvres for drivers and increasing pedestrian safety.

[0008] In particular, the procedure according to the present invention is based on an initial phase using automatic means to detect the movement of pedestrians in the vicinity of a vehicle junction, and a second phase where the vehicle driver is provided with information about pedestrian movement in the vicinity of the junction.

[0009] The pedestrian movement detection phase may be performed by means, for example, of cameras and/or sensors, such as volumetric, infrared or other types of sensors.

[0010] The phase where the driver is given information may be performed by means of a monitor or by producing an optical and/or acoustic warning signal using computational means.

[0011] Logically, the signals given to the driver should avoid producing a false sense of security in him, should no pedestrians be detected in the vicinity of the junction. Accordingly, for example, in a preferred embodiment of the invention, detection using a camera and detection using sensors will be combined, giving the driver information both on a screen showing what the cameras have shot and by means of optical and/or acoustic warning signals generated by the detection of pedestrian movement by the sensors, or alternatively it is combined with permanent warning indicator systems.

[0012] In preferred embodiments of the present invention, said phases will be combined with phases for detecting the movement of vehicles towards the junction and the generation of a warning signal for pedestrians who are in the vicinity of the vehicle junction.

[0013] The device according to the present invention, for performing the procedure described above, will consist, at least, of:

- a system for sensing the movement of pedestrians in the vicinity of the area of the vehicle junction;
- a central control unit for the signal captured by the sensor system that also generates information for the driver of the vehicle depending on the signal;
- a system for transmitting information to the driver.

[0014] The sensor system may consist, for example, of a system of cameras and/or presence sensors, such as volumetric, infrared or other types of sensor. Preferably, a camera system will be combined with presence sensors.

[0015] The system for transmitting information to the driver may consist of a visual system, such as a screen which, for example, shows what the cameras have shot, of a pictographic system which provides a warning signal, for example, depending on what has been detected by the presence sensors, or an acoustic warning system, or a combination thereof.

[0016] Preferably, the device will also comprise a system provided with a minimum of a vehicle movement sensor and an optical and/or acoustic warning device to pedestrians of the presence of a vehicle in the vicinity of

the junction.

[0017] For a better understanding of the invention, the accompanying drawings of embodiments of the present invention are provided as an explanatory but not limiting example.

[0018] Fig. 1 shows a block diagram that illustrates diagrammatically the components of an embodiment of the device to which the present invention relates.

[0019] Fig. 2 shows a perspective view of a vehicle junction, in particular a parking area exit, provided with a device according to the present invention.

[0020] Fig. 3 shows another perspective view of a parking area exit provided with a different embodiment of the device according to the present invention.

[0021] Fig. 4 is a perspective view showing, in greater detail, the external elements of a further embodiment of the device according to the present invention.

[0022] Fig. 1 shows a block diagram illustrating diagrammatically the differing components of a device according to the present invention and the links established between said elements. The embodiment shown comprises a central control unit 1 by means of which the rest of the components of the embodiment are interconnected, including a system of information sensors 4 with sensors for detecting the presence of pedestrians 41 and a warning system 3 to warn the driver of the vehicle. In addition, the illustration shows a communications inlet 5 through which, using a personal computer, the operation of the system can be controlled, and another communications inlet 6 used to connect to other pieces of equipment arranged, for example, in the same building as that in which the device is located.

[0023] In addition, in order to increase safety synergy, the embodiment illustrated has internal information sensors 42, for capturing information on vehicles approaching the vehicle junction, and an external warning system 2 for said pedestrians. Thus, information is provided simultaneously both to the driver and to pedestrians of the existence of a danger of an accident, and the possibility of this occurring is minimised.

[0024] The information sensors 41 for pedestrians situated in the vicinity of the vehicle junction may be presence and/or movement sensors, such as volumetric or infrared sensors. Video cameras may also be incorporated. Preferably, the presence of video cameras may be combined with presence and/or movement sensors.

[0025] The information sensors 42 for vehicles approaching the junction may, because of their characteristics and location, be volumetric, infrared, magnetic, infrared, etc. sensors. The system 3 for warning the vehicle driver may comprise monitors and visual, pictographic and/or acoustic warning systems. The optional pedestrian warning system 2 may include acoustic, pictographic, luminous, acoustic or other types of warning elements.

[0026] Fig. 2 shows a perspective view of an embodiment of a device according to the present invention. The figure shows a pedestrian 10 walking along a pedestrian route or pavement 16 that passes through an intersection with a junction 30 for vehicles 11 from a parking area. On either side of the junction 30 volumetric sensors 17 have been arranged to detect the movement of pedestrians 10. In this embodiment, when the sensors 17 detect a pedestrian, they emit a signal, for example a pictographic signal, by means of the monitor 13 which informs the driver of the vehicle 11 approaching the junction 30 of the presence of pedestrians 10. The system also has sensors 14, 15, which detect the presence of a vehicle 11 heading towards the junction 30, generating a pictographic warning signal to pedestrians 10 by means of luminous elements 12. Finally, in the present embodiment, a luminous warning element 18 to the driver has also been added in order to remind the driver of the vehicle that he must manoeuvre with care even when no warning that pedestrians have been detected is projected on the element 13.

[0027] Fig. 3 shows another embodiment of the device according to the present invention which may be regarded as an extension of the embodiment shown earlier in Fig. 2. The elements that are common or similar to those in Fig. 2 have been shown with identical numerals. Unlike the previous embodiment, in this case, the sensors 17 for pedestrians 10 illustrated are of the infrared type, and cameras 19 have also been placed to take images of the vicinity of the junction 30, the images taken being shown, for example, by means of the monitor 13 so as to inform the driver of the state of the pedestrian route 16 on either side of the junction 30. In order to not interrupt the images displayed on the monitor 30, if the sensors 17 detect a pedestrian 10 walking towards the junction 30 a pictographic warning signal is produced for the driver by means of the luminous element or panel 21, which, alternatively to the one illustrated, may also be a traffic light that changes from amber to red when the sensors 17 detect a pedestrian 10. It may also be, for example, a luminous warning light situated on the parking area exit barrier. Finally, to improve the degree of warning to the pedestrian 10, luminous signals 20 have been placed integrally with the pavement, delimit the junction 20 and are actuated when the sensors 14, 15 detect a vehicle 11 being driven towards the junction 30. Thus, the pedestrian receives a visual warning even when he is not looking forwards.

[0028] Finally, Fig. 4 shows a further embodiment, similar to the one shown in Fig. 3, in which a module 31 is arranged recessed in the walls adjacent to the junction 30, which comprises a volumetric sensor 17 of the presence of pedestrians 10 and an acoustic-type signal generator 25 to warn the pedestrian. The combination of an acoustic and visual signal ensures that the pedestrian warning is effective. When acoustic-type signals are produced for the pedestrian 10, the central control unit of the device should have means of discerning the time of day, so that during the night the acoustic signal can be reduced or eliminated, depending on the requirements of the location.

[0029] Operation of the embodiments illustrated in the

above figures is explained below.

[0030] The sensor system 41 collects information on the presence and/or approach of pedestrians in the vicinity of the vehicle junction and, by means of the central control unit, provides information to the vehicle on state of traffic on the pedestrian way by means of the vehicle information warning system 3, which includes, for example, monitors 13 and/or luminous elements 21. Thus, the vehicle driver is aware of the presence of pedestrians outside his field of vision, in the vicinity of the junction. Simultaneously, the other sensor system 42 (comprising, for example, the sensors 14, 15) detects the presence of a vehicle and issues a warning by means of the system 4 for warning the pedestrian 10 (which may, for example, comprise luminous panels 12, luminous components on the ground 20 or sound indicators 25) so that the pedestrian 10 also becomes aware of the presence of the vehicle 11. Thus, the pedestrian is also aware of the presence of the vehicle and can pay more attention and/or reduce his speed, thus minimising the possibility of an accident.

[0031] A person skilled in the art will be able to see that the embodiments illustrated in the differing figures may be combined with each other without departing from the scope of the invention, and similarly the elements illustrated in the examples may be replaced by others that perform the same functions, also without departing from the scope of the invention defined in the independent claims.

Claims

1. Safety procedure in a vehicle junction across a pedestrian route, said junction having reduced visibility and corresponding with a parking area exit (30) of a building which comprises the following phases:

   an initial phase using automatic means to detect pedestrian (10) movement said automatic means comprising the use of a camera (19) placed outside of said building, and
   a second phase in which the vehicle driver is provided with information on the movement of pedestrians in the vicinity of the junction, said information comprising the projection on a monitor (13) of images from said camera,

   characterised in that said second phase comprises the projection on a monitor (13) or images of the vicinity of the junction, outside the field of vision of the driver, taken by said camera (19) and **in that** the procedure is also combined with a phase of detecting vehicle movement (14, 15) towards the junction and the generation of a warning signal of said movement to pedestrians located in the vicinity of the vehicle junction.

2. Procedure, according to claim 1, **characterised in that** said initial phase of detecting pedestrian movement comprises taking images (19) on either side of the junction.

3. Procedure according to claim 1 or 2, **characterised in that** in said initial phase presence and/or movement sensors (17) are used.

4. Procedure according to claim 3, **characterised in that** said initial phase uses volumetric or infrared sensors.

5. Procedure according to claim 4, **characterised in that** the phase in which the vehicle driver is provided with information on pedestrian (10) movement comprises a phase to generate a warning signal (21) to the vehicle driver depending on the results obtained in the initial detection phase.

6. Procedure according to claim 5, in which the generation of a warning signal to the driver comprises the generation of a visual and/or pictographic signal (21).

7. Procedure according to anyone of claims 1 to 6, **characterised in that** said movement warning signal for pedestrians comprises the generation of a visual (21), acoustic and/or acoustic signal.

8. System for performing a procedure according to anyone of claims 1 to 6, which comprises:

   - a system for sensing the movement of pedestrians (10), the sensor system comprising at least one camera directed to the vicinity of a vehicle exit
   - a central control unit for the signal captured by the sensor system which also generates information for the vehicle driver depending on the signal;
   - a system for transmitting information to the driver, comprising a monitor (13), which projects images from said camera
   - a vehicle movement sensor (14, 15), and
   - a system for transmitting information to the pedestrian (20).

9. System, according to claim 8, **characterised in that** it comprises two cameras (19) for taking images on either side of the junction.

10. System according to claim 8 or 9, **characterised in that** said sensor system comprises presence and/or movement sensors (17).

11. Device according to claim 10, **characterised in that** said sensor system comprises volumetric and/or infrared sensors.

12. Device according to any one of claims 8 to 11, **characterised in that** the system for transmitting information to the driver comprises a luminous alarm (21) situated on the exit barrier of a parking area.

13. Device according to anyone of claims 7 to 12, **characterised in that** the system for transmitting information to the driver and/or the system for informing the driver comprise a system for generating pictographic signals (21).

14. Device according to claim 13, **characterised in that** the system for transmitting information to the pedestrian comprises a system for generating acoustic signals.

15. Device according to claim 14, **characterised in that** it comprises a module comprising pedestrian movement sensor (17) and generators of acoustic signals to pedestrians.

Patentansprüche

1. Sicherheitsroutine für die Querung eines Fußgängerweges durch eine Fahrstraße, wobei dieQuerung eingeschränkte Sichtverhältnisse aufweist und mit einer Parkplatzausfahrt (30) eines Gebäudes in Verbindung steht und wobei die Sicherheitsroutine die folgenden Phasen umfasst:

> eine erste Phase, welche automatische Mittel zur Detektion von Fußgängerbewegungen (10) benutzt, wobei diese automatischen Mittel die Verwendung einer Kamera (19), die außerhalb des Gebäudes platziert ist, umfassen; und
> eine zweite Phase, in der der Fahrzeugfahrer mit der Information über die Bewegung von Fußgängern in der Nähe der Querung versorgt wird, wobei diese Information die Projektion von Bildern dieser Kamera auf einen Monitor (13) umfasst,

dadurch gekennzeichnet, dass die zweite Phase die Projektion von Bildern aus der Nähe der Querung auf einen Monitor (13) umfasst, außerhalb des Sichtfelds des Fahrers, aufgenommen durch die Kamera (19), und **dadurch gekennzeichnet, dass** die Routinezusätzlich mit einer Phase der Detektion von Fahrzeugbewegung (14, 15) in Richtung der Querung sowie der Erzeugung eines Warnsignals für die Bewegung von Fußgängern, welche sich in der Nähe derQuerung befinden, kombiniert wird.

2. Routine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die erste Phase der Detektion von Fußgängerbewegung umfasst, dass Bilder (19) von beiden Seiten der Querung aufgenommen werden.

3. Routine gemäß der Ansprüche 1 und 2, **dadurch gekennzeichnet, dass** in der ersten Phase Präsenz- und/oder Bewegungssensoren (17) eingesetzt werden.

4. Routine gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die erste Phase volumetrische Sensoren oder Infrarotsensoren einsetzt.

5. Routine gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die Phase, in der der Fahrzeugfahrer mit der Information über Fußgängerbewegung (10) in der Nähe der Querung versorgt wird, eine Phase umfasst, um ein Warnsignal (21) für den Fahrzeugfahrer zu erzeugen abhängig von der Ergebnissen, welche in der ersten Detektionsphase erzielt werden.

6. Routine gemäß Anspruch 5, in welchem die Erzeugung eines Warnsignals für den Fahrer die Erzeugung eines visuellen oder piktografischen Signals (21) umfasst.

7. Routine gemäß einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** das Bewegungswarnsignal für Fußgänger die Erzeugung eines visuellen (21), akustischen und/oder akustischen Signals umfasst.

8. System zum Ausführen einerRoutine gemäß einem der Ansprüche 1 bis 6, welches umfasst:

> - ein System zum Erfassen der Bewegung von Fußgängern (10), wobei das Erfassungssystem wenigstens eine Kamera umfasst, welche auf die nähere Umgebung derAusfahrt gerichtet ist
> - eine zentrale Kontrolleinheit für das von dem Erfassungssystem eingefangene Signal, welche abhängig vom Signal Information für den Fahrzeugfahrer erzeugt;
> - ein System zur Übertragung von Information zu dem Fahrer, welches einen Monitor (13) umfasst, der Bilder von der Kamera darstellt
> - einen Fahrzeugsbewegungssensor (14, 15), und
> - ein System zum Übertragen von Information zu dem Fußgänger (20).

9. System gemäß Anspruch 8, **dadurch gekennzeichnet, dass** es zwei Kameras (19) für die Aufnahme von Bildern auf beiden Seiten der Querung umfasst.

10. System gemäß der Ansprüche 8 oder 9, **dadurch gekennzeichnet, dass** das Sensorsystem Präsenz- und/oder Bewegungssensoren (17) umfasst.

11. Vorrichtung gemäß Anspruch 10, **dadurch gekennzeichnet, dass** das Sensorsystem volumetrische

und/oder Infrarotsensoren umfasst.

12. Vorrichtung gemäß einem der Ansprüche 8 bis 11, **dadurch gekennzeichnet, dass** das System zur Übertragung von Information zu dem Fahrer einen leuchtenden Alarm (21) umfasst, der an der Ausgangschranke des Parkplatzes platziert ist.

13. Vorrichtung gemäß einem der Ansprüche 7 bis 12, **dadurch gekennzeichnet, dass** das System zur Übertragung von Information zu dem Fahrer und/oder das System zum Informieren des Fahrers ein System zur Erzeugung von piktografischen Signalen (21) umfasst.

14. Vorrichtung gemäß Anspruch 13, **dadurch gekennzeichnet, dass** das System zur Übertragung von Information zu dem Fußgänger ein System zur Erzeugung eines akustischen Signals umfasst.

15. Vorrichtung gemäß Anspruch 14, **dadurch gekennzeichnet** es ein Modul umfasst, welches Fußgängerbewegungssensoren (17) und Erzeuger für akustische Signale für den Fußgänger umfasst.

Revendications

1. Procédure de sécurité dans une jonction de véhicule sur une route piétonnière, ladite jonction présentant une visibilité réduite et correspondant à une sortie de zone de parking (30) d'un bâtiment, la procédure comprend les phases suivantes :

> une phase initiale utilisant des moyens automatiques pour détecter un mouvement de piétons (10), lesdits moyens automatiques comprenant l'utilisation d'une caméra (19) placée à l'extérieur dudit bâtiment, et
> une seconde phase, dans laquelle le conducteur du véhicule est doté d'une information sur le mouvement de piétons à proximité de la jonction, ladite information comprenant la projection sur un moniteur (13) d'images de ladite caméra,

caractérisée en ce que ladite seconde phase comprend la projection sur un moniteur (13) d'images à proximité de la jonction, en dehors du champ de vision du conducteur, prises par ladite caméra (19) et **en ce que** la procédure est aussi combinée à une phase de détection du mouvement du véhicule (14, 15) vers la jonction et la génération d'un signal d'avertissement dudit mouvement à l'attention des piétons situés à proximité de la jonction du véhicule.

2. Procédure selon la revendication 1, **caractérisée en ce que** ladite phase initiale de détection de mouvement de piétons comprend la prise d'images (19) de chaque côté de la jonction.

3. Procédure selon la revendication 1 ou 2, **caractérisée en ce que** des capteurs de présence et/ou de mouvement (17) sont utilisés dans ladite phase initiale.

4. Procédure selon la revendication 3, **caractérisée en ce que** ladite phase initiale utilise des capteurs volumétriques ou infrarouges.

5. Procédure selon la revendication 4, **caractérisée en ce que** la phase, dans laquelle le conducteur du véhicule est doté d'information sur le mouvement de piétons (10) comprend une phase pour générer un signal d'avertissement (21) à l'attention du conducteur du véhicule selon les résultats obtenus dans la phase de détection initiale.

6. Procédure selon la revendication 5, dans laquelle la génération d'un signal d'avertissement à l'attention du conducteur comprend la génération d'un signal visuel et/ou pictographique (21).

7. Procédure selon l'une quelconque des revendications 1 à 6, **caractérisée en ce que** ledit signal d'avertissement de mouvement pour piétons comprend la génération d'un signal visuel (21), acoustique et/ou acoustique.

8. Système de réalisation d'une procédure selon l'une quelconque des revendications 1 à 6, qui comprend :

> - un système de détection du mouvement de piétons (10), le système de détection comprenant au moins une caméra dirigée à proximité d'une sortie de véhicule ;
> - une unité de commande centrale pour le signal capturé par le système de détection qui génère aussi l'information pour le conducteur du véhicule selon le signal ;
> - un système de transmission de l'information au conducteur, comprenant un moniteur (13) qui projette des images de ladite caméra,
> - un capteur de mouvement de véhicule (14, 15) ; et
> - un système de transmission d'une information au piéton (20).

9. Système selon la revendication 8, **caractérisé en ce qu'**il comprend deux caméras (19) pour prendre des images de chaque côté de la jonction.

10. Système selon la revendication 8 ou 9, **caractérisé en ce que** ledit système de détection comprend des capteurs de présence et/ou de mouvement (17).

11. Dispositif selon la revendication 10, **caractérisé en**

ce que ledit système de détection comprend des capteurs volumétriques et/ou infrarouges.

12. Dispositif selon l'une quelconque des revendications 8 à 11, **caractérisé en ce que** le système de transmission de l'information au conducteur comprend une alarme lumineuse (21) située sur la barrière de sortie d'une zone de parking.

13. Dispositif selon l'une quelconque des revendications 7 à 12, **caractérisé en ce que** le système de transmission de l'information au conducteur et/ou le système d'information du conducteur comprend un système pour générer des signaux pictographiques (21).

14. Dispositif selon la revendication 13, **caractérisé en ce que** le système de transmission de l'information au piéton comprend un système pour générer des signaux acoustiques.

15. Dispositif selon la revendication 14, **caractérisé en ce qu'**il comprend un module comprenant des capteurs de mouvement de piétons (17) et des générateurs de signaux acoustiques à l'attention des piétons.

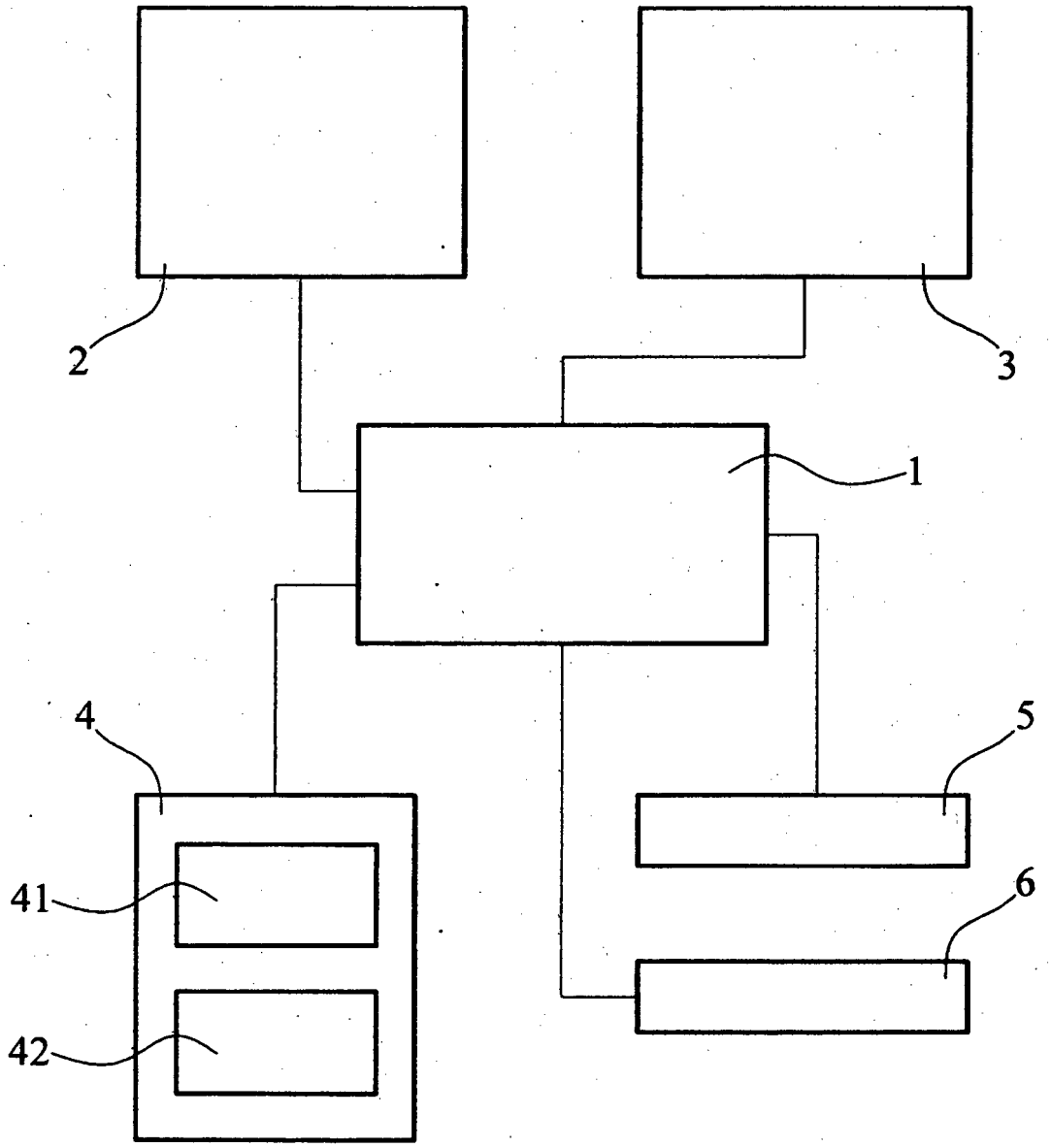


FIG.1

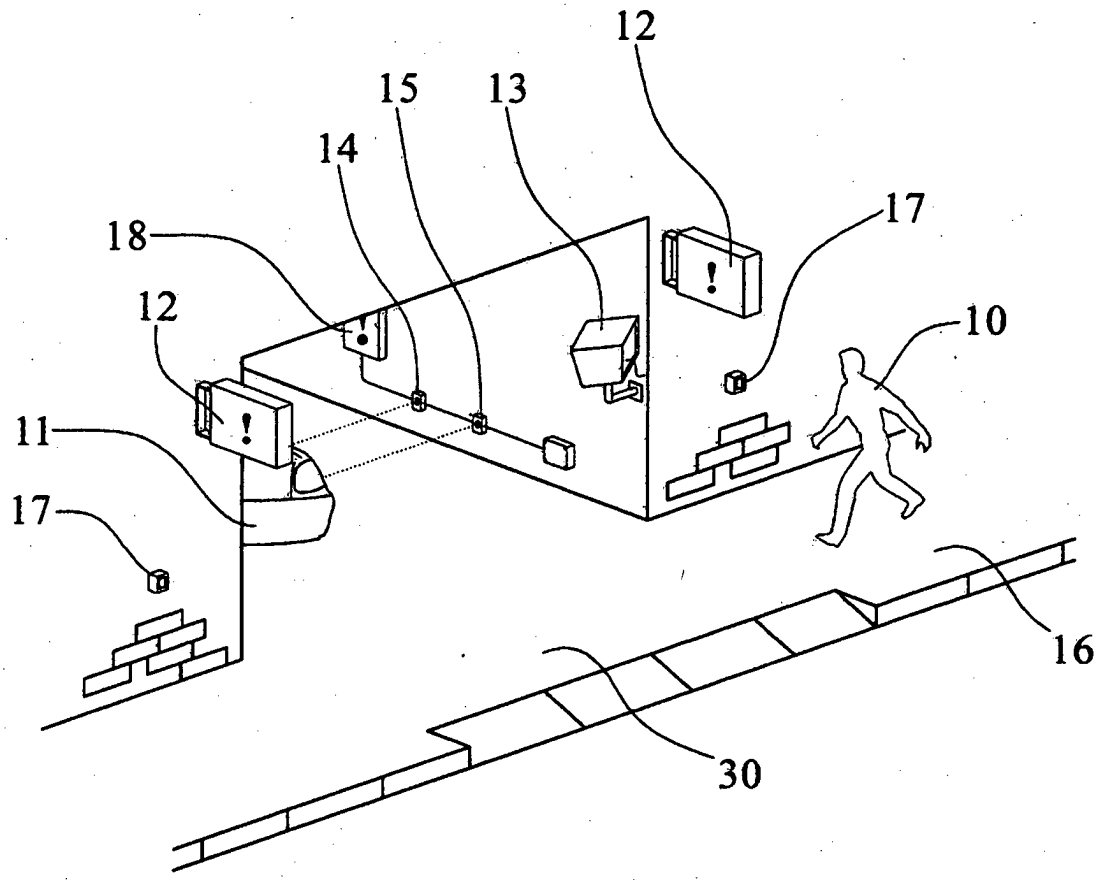


FIG.2

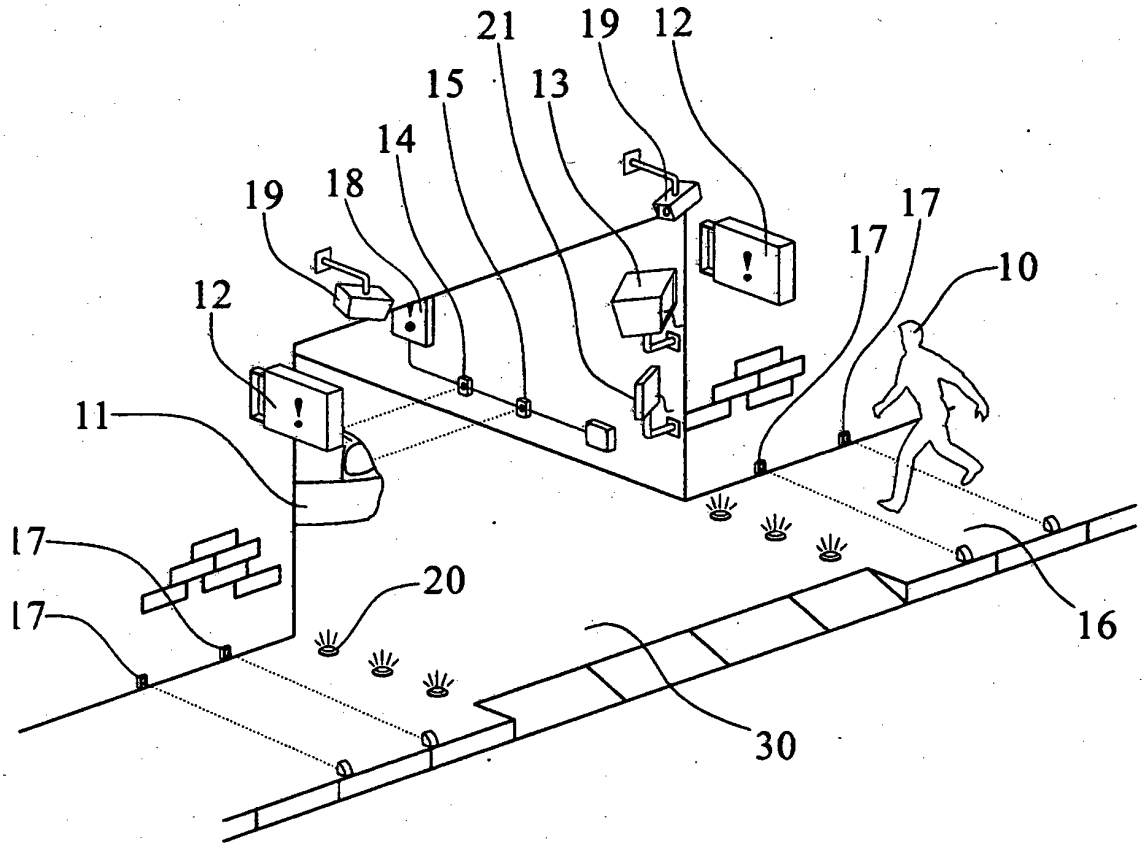


FIG.3

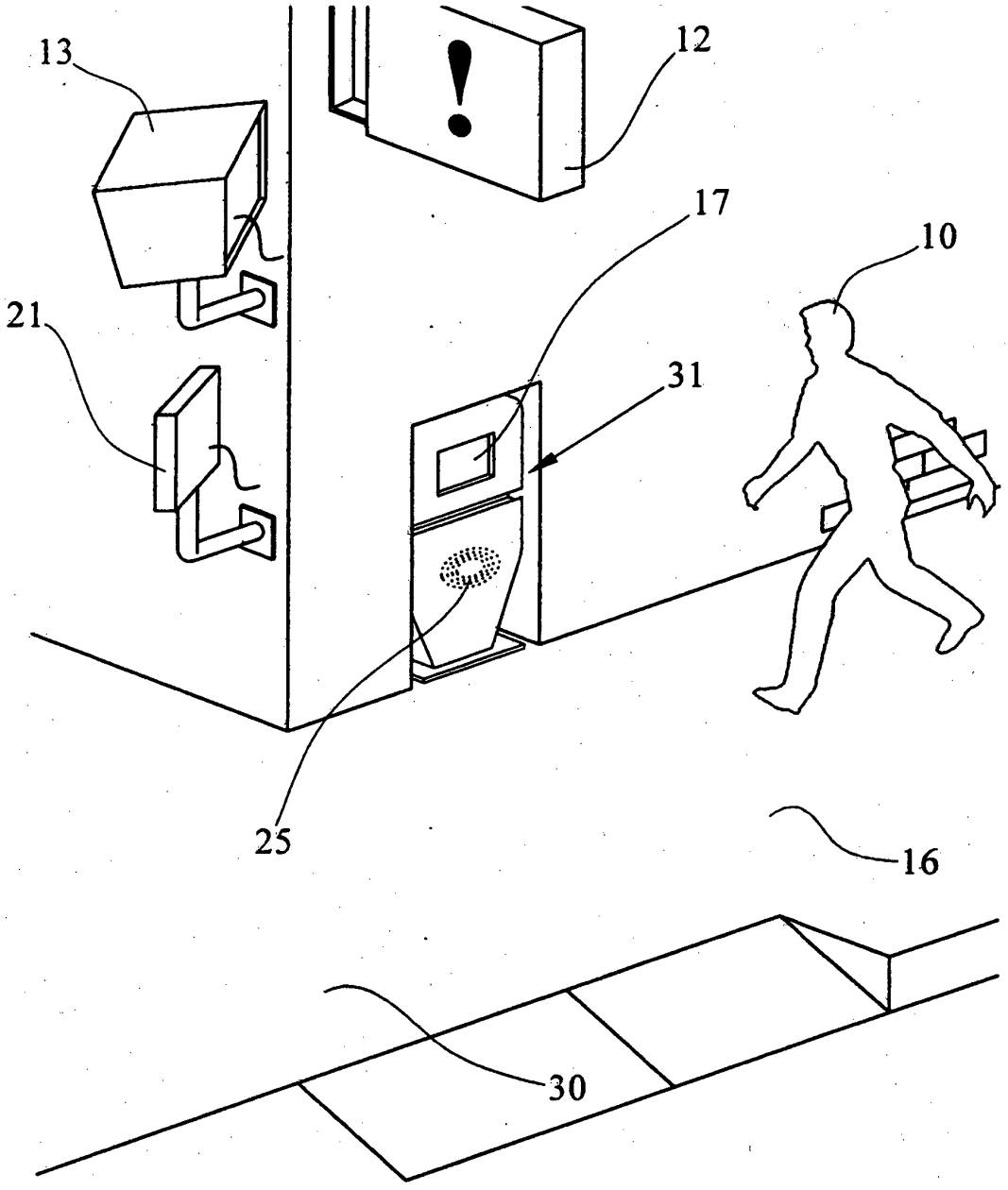


FIG.4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1351207 A **[0005]**
- US 20050156758 A1 **[0006]**