



(43) International Publication Date  
14 February 2013 (14.02.2013)

- (51) **International Patent Classification:**  
G08G 1/005 (2006.01) G08G 1/0967 (2006.01)  
G08G 1/16 (2006.01)
- (21) **International Application Number:**  
PCT/IT2012/000233
- (22) **International Filing Date:**  
27 July 2012 (27.07.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
TA201 1A00008 5 August 2011 (05.08.2011) IT
- (72) **Inventor; and**
- (71) **Applicant : CAICO, Giovanni** [IT/IT]; Via Alessandro Volta n. 34, San Giorgio Jonico, I-74027 Taranto (IT).
- (81) **Designated States** (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**  
— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

WO 2013/021403 A2

(54) **Title:** MODULAR ELECTRONICALLY AUTOMATED SYSTEM FOR SAFETY OF TRAFFIC ON THE URBAN AND EXTRA-URBAN ROAD NETWORKS

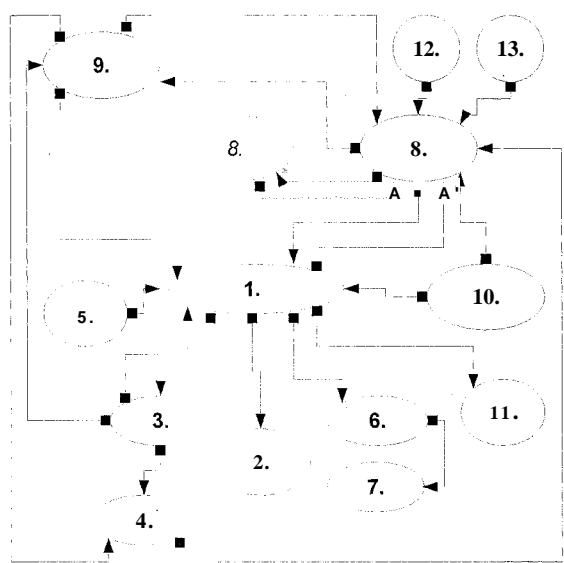


Fig. 1.

(57) **Abstract:** The invention relates to a modular system of active safety, being able to work fully automatic, made of electronically controlled devices, usable in specific conditions for urban road networks and for extra-urban road networks, formed by the functional union of some fixed devices installed in various road areas, some mobile devices installed on vehicles and some portable devices used by pedestrians and cyclists, all of these devices being interconnected by radio frequency, forming their own network or using a communication network that already exists. The system allows real-time control of the movement speed of road vehicles, by informing and warning of drivers operating the vehicles, in accordance with: provisions of law, with repetitive conditions, special conditions: the incidence or the imminence of some weather phenomena, the proximity of some emergency vehicles or special vehicles; the system allows real-time identification of offenders and their immediate automated punishment, through direct interventions applicable to vehicles.

**"MODULAR ELECTRONICALLY AUTOMATED SYSTEM FOR SAFETY OF TRAFFIC ON THE URBAN AND EXTRA-URBAN ROAD NETWORKS,"**

**Invention** relates to a modular system of active safety capable of operating fully automatically, consisting of electronically controlled devices, interconnected via radio frequency, usable in specific conditions for the networks of urban roads, as well as for the networks of extra-urban roads.

**There are known** mechanical, electromechanical or electronic, that: inform the participants of the traffic about some predetermined conditions, repetitive, or special; measure the speed of moving vehicles in traffic; automatically identify offenders who exceed the speed limit; warn traffic participants about the presence in the area of some emergency vehicles, or of some special vehicles; limit the maximum speed of moving vehicles; stop the march of vehicles; prohibit the access of vehicles on the sidewalk.

**The disadvantage** of these devices is that: they are not interconnected; important building changes are involved to comply with certain regional or local situations; presenting difficulties to aggregation as functional systems; do not allow the immediate control of the contravention.

**The purpose of the invention** is to reduce mortality, injuries and material damage caused by: collision between vehicles, the injuries caused to pedestrians and cyclists, to cover the lack of permanent information for traffic participants about some special conditions occurred on certain areas of road, to induce a responsible attitude of the traffic participants (drivers, pedestrians, cyclists), to cover the lack of immediate effects upon offenders.

**The technical problem** solved by the invention is designing a modular system consisting of interconnected devices, adaptable for the use in specific conditions of the road traffic, as well as urban and suburban, which allows the real-time control of the speed displacement of vehicles by

promptly informing and warning the drivers of vehicles to operate in accordance with: government regulations (maximum speed in the locality, etc.), local regulatory (maximum speed in tourist areas, etc.), traffic with repetitive conditions (the smooth flow of traffic during certain peak times, times of day / night, weekends, etc.), special traffic conditions, including those caused by the occurrence or the imminence of certain weather phenomena, or the proximity of some emergency vehicles: police, ambulance, fire department, or special vehicles, including: trams, trains, vehicles accompanying over-sized transport etc.

The invention eliminates disadvantages of the known solutions, **by the fact that** a modular system is formed by the functional union of some devices installed in certain road areas, some devices installed on vehicles and some handheld devices being used by pedestrians and cyclists, all of these devices being interconnected via radio frequency, forming their own network or using a communication network already existing, according to **Fig.1.** which shows a diagram of the principle of operation of a modular electronically automated system for active safety in urban and extra-urban traffic.

**Section 1.** A **controller 1** is a fixed device installed in a sector of road that has the role to determine the maximum speed permitted on a sector of road on the basis of repetitive, weather or occasional conditions, when it is necessary to perform a de-congestion of road traffic flows; controller 1 comprises the following modules:

- **1.1.** An automatic timer-type programming unit, for determining the repetitive conditions, which is accomplished according to: day / night operation, working days / week-end, hours of heavy traffic, other conditions provoked by repetitive specific local road traffic; for any repetitive situation, a specific signal is transmitted through an unit for coding and radio frequency emittance;
- **1.2.** an optical sensor that provides the continuous monitoring of meteorological conditions; if poor visibility situations are identified: snow, fog, intense rain, smoke and

dust etc. - a specific signal is transmitted through an unit for coding and radio frequency emittance;

- **1.3.** a thermal sensor that provides the continuous monitoring of meteorological conditions; if it identifies the possibility of ice formation on the surface of the road - a specific signal is transmitted through an unit for coding and radio frequency emittance;

- **1.4.** a humidity sensor that provides the continuous monitoring of meteorological conditions; if situations which provokes reduced grip on the road are identified: rain, snow - a specific signal is transmitted through an unit for coding and radio frequency emittance;

- **1.5.** unit receiving radio frequency signals and decoding of some receiving them from other devices in the system, as it should be: a supervisor 3 as described in Section 3, a barrier 5 as described in Section 5, a device for intercommunication 8 as described in Section 8, a device for emergency vehicles 9 as described in Section 9, or a device for special vehicles 10 as described in Section 10; if the occasional situations are identified on the road sector, as would be: the occurrence of some accidents, the temporary increase of the road traffic intensity, special interventions for road assistance, carrying out some maintenance work on the road etc. - a specific signal is transmitted through a unit of coding and radio frequency permanent emittance and through a unit of coding and radio frequency special emittance;

- **1.6.** a unit of encoding and radio frequency special emittance which, if the traffic needs a better **flowing** because of some special situations, it transmits signals individualized to each semaphore with progressive warning 6 as described below in Section 6 set to a traffic lane on a certain sector of road, to extend with predetermined intervals the time of the priority accorded to the crossing for vehicles on the traffic lane controlled by that semaphore;

- **1.7.** a unit of encoding and emittance of radio frequency broadcasts continuously, for a distance which comprises at least **300** meters in urban areas, and at least **700** meters in suburban areas, a series of signals which include: the maximum speed limit allowed and the reason: legal, local, weather, or special which is setting the certain speed limit;

**Section 2.** A **panel 2** is a fixed device installed on a road sector and has the role of warning the participants in road traffic, through text and / or variable graphical icons, according to the encoded signals emitted by a controller **1**; panel **2** comprises the following modules:

- **2.1.** radio frequency receiving and decoding unit that receives from a controller **1**, the information concerning the maximum speed permitted on the sector of road, together with the description of conditions mentioned above in Section **1**, which set the respective speed limit;
- **2.2.** a display unit having the adequate size to be easily observed and interpreted by drivers of vehicles, which presents information received from a controller **1** shown above in **Section 1**, by the form of text and / or intuitively by variable graphical icons;

**Section 3.** A **supervisor 3** is a fixed device installed in a sector of road, which has the role of permanent traffic monitoring of a single lane or both senses of a road sector; supervisor **3** comprises the following modules:

- **3.1.** some cameras which monitor traffic in both senses;
- **3.2.** counting unit that transmits through a module of encoding and emittance of radio frequency signal to the controller **1**, when a vehicle passes in front of the camera, to determine the risk of traffic congestion;
- **3.3.** a device for measuring the speed of each moving vehicle and for transmitting the measured speed to a control unit;

- **3.4.** radio frequency reception and decoding unit that continuously receives from the controller **1**, the maximum speed permitted on the sector of road;
- **3.5.** a control unit that compares the speed of each monitored vehicle with the maximum allowed limit on the sector of road, which it receives continuously from the controller **1**; if the monitored vehicle speed is higher than the maximum allowable limit on the sector of road, a specific signal is transmitted via a module of encoding and emittance of radio frequency;
- **3.6.** an unit of encoding and emittance of radio frequency transmits, for a time synchronized with the speed of the vehicle, an activation signal to a specific penalizer **-4** for the application of a penalty upon the vehicle driven by the offender; during this time, the signal is transmitted towards the controller **1**.

*Section 4.* A **penalizer 4** is a fixed device installed in a sector of road, which has the role of punishing in real-time an offender; penalizer 4 comprises the following modules:

- **4.1.** a unit for radio frequency receiving and decoding, which, during a specific activation signal received from a supervisor **3**, transmits a specific signal to a module for punishing in real-time a vehicle driven by an offender; a specific signal for disabling, received from a device for intervention vehicle **9**, ensures the temporary disabling of penalizer **4** in the immediate vicinity of the path followed by an emergency vehicle;
- **4.2. a module for punishing** in real-time a vehicle driven by an offender, can be: a **mobile nails barrier** (conforming to **Example 1** presented below), or a **cannon with paint, liquid rubber or other chemical dyes with rapid drying** (according to **Example 2** presented below), or a **spray of chemicals with unpleasant smell**(according to **Example 3** presented below);

- **4.3.** unit of encoding and emitting radio frequency, alerts a device for intercommunication **8** installed in a vehicle found in the area, about the risk of accident due to a penalized vehicle .

*Section 5.* A **barrier for one-way street 5** is a fixed device installed in an area with risk of road accidents at leaving of a one-way street, to enforce the direction; **barrier for the one-way 5** comprises the following modules:

- **5.1.** a rocker assembly, having a flat top surface which allows the passage of vehicles driving in right sense; the flat top surface is mounted on a system of hinges; the edge of the rocker assembly which is oriented against the regular sense of driving, comprising sharpen tops, remains slightly elevated by means of elastic tensioners, so that if a vehicle comes from the opposite direction than the regular one, the tires of this vehicle will be perforated so the pressure is lost immediately; when a vehicle enters from forbidden sense, a switch commands a specific signal via a unit of encoding and transmitting radio frequency;
- **5.2.** a unit of encoding and emitting a radio frequency warns a controller **1** about the risk of accident due to the intrusion of a vehicle on forbidden sense ;

*Section 6.* A **traffic light with progressive warning 6** is a fixed device installed on a sector of road that has modules with warning light green, yellow and red, respectively located in three places; **traffic light with progressive warning 6** comprises the following modules:

- **6.1.** a green light warning module is located with 50 to 150 meters before the place where a driver have to give way in a crossing; the distance is chosen so that a vehicle moving at speeds within the limits allowed on the street sector should be able to pass safely through the crossing; the green light comes on for as long as there is priority on

the traffic lane controlled by traffic light; green light goes out with an interval of time before the priority is lost on the lane traffic controlled by traffic light, the time interval will be sufficient for a vehicle traveling at the speed within the limits allowed on that section of road, to stop safely before the red light warning module;

- 6.2. a warning module with yellow light, is located approximately half the distance between the warning module with green light and the warning module with red light; the distance will be chosen according to the scheme of the prevailing speed of that sector of the road; the yellow light is turned on with a time interval before the losing of priority on the lane controlled by traffic lights, so the time interval should be sufficient for a vehicle traveling on that sector of the road to be able to stop safely before the warning module with red light; the yellow light is turned off at the same time with the recovery of the priority for the vehicles on that lane;
- 6.3. a warning module with red light, is located in the place where a driver must yield precedence; the red light comes on at the same time with the loss of the priority on the traffic lane; the red light goes off when the priority is recovered for vehicles on that lane;
- 6.4. an unit for radio frequency reception and decoding of the individualized command signal issued by a controller 1 may prolong the time of passage of the priority accorded to vehicles, with predetermined intervals according to the intensity of the traffic on the traffic lane for better traffic flow on the lane commanded by traffic light, in special situations;
- 6.5. an unit for encoding and radio frequency emittance that transmits a specific signal to a certain shield for pedestrian traffic 7, to synchronize it with the traffic Lights with progressive warning 6;



- **6.6.** a "V"-shaped channel to increase the attention of drivers of vehicles along the zone of pedestrian crossings and to prevent access of vehicles on the sidewalk; a channel, is situated at a distance between the position of the module with light green and the position of the module with red light, and is provided in a form of a letter "V", having one side inclined towards the road and a side perpendicular to the surface of the sidewalk; the maximum depth of a channel will be at least equal to the radius of tires mounted on most vehicles that circulate normally on that sector of the road;

**Section 7.** A **shield for pedestrian traffic 7** is a fixed device installed on a sector of road which is synchronized, by means of a module for radio frequency receiving and decoding, with the signal emitted by a traffic light with progressive warning **6** or by a classical traffic light, through an appropriate interface; **shield for pedestrian traffic 7** comprises the following modules:

- **7.1.** a module for radio frequency reception and decoding, which picks up a signal from a traffic light with progressive warning **6** or from a classical traffic light, through an appropriate interface; upon receipt of a specific signal, it transmits a command to a pair of barriers;
- **7.2.** a pair of automatically controlled barriers are placed to stop the access of vehicles in the area of semaphORIZED pedestrian crossings, for as long as the priority given to pedestrians;
- **7.3.** some sensors, already known, determine whether the walkway is free, to extend the time of passage priority given to pedestrians, so to facilitate the safe passage of people moving slowly, as it would be: persons accompanying children, people with impaired mobility etc.;
- **7.4.** a "V"-shaped channel to increase the attention of drivers of vehicles in the area of pedestrian crossings and to prevent vehicle access onto the sidewalk, is located in the

areas of road where the shields for pedestrians are installed, and is provided in a form of "V" shaped channels, having one side inclined towards the road and a side perpendicular to the surface of the sidewalk; the maximum depth of a channel will be at least equal to the radius of the tires mounted on most vehicles that usually circulate on that sector of the road.

**Section 8.** A **device for intercommunication 8** is a mobile device installed in a vehicle, to ensure the operation during all the time of activation of the starting contact of the vehicle; **device for intercommunication 8** comprises the following modules:

- **8.1. some special sensors for continuous monitoring** of the vehicle:
- **8.1.1.** an inertial sensor already known that, while the progressive reduction of the speed of the vehicle after a long braking, commands the emittance of a specific signal via a unit of coding and radio frequency emission for a distance of approximately 150/500 meters, to some intercommunication devices **8** installed in other vehicles being in the area, warning upon the risk of formation of queues of sudden traffic jams, in the same time also activating the emergency lights of the vehicle;
- **8.1.2.** an inertial sensor already known that, at the immediate slowdown in speed caused by a sudden braking, commands the emission of a specific signal via a unit of coding and radio frequency emittance for a distance of 150/500 meters approximately, to warn intercommunication devices **8** installed in other vehicles found in the area, about the risk of impact, at the same time also activating the emergency lights of the vehicle;
- **8.1.3.** a number of sensors for impact already known are configured to receive correspondence in frontal, side and rear impacts on the vehicle; in situation of an accident, activating at the same time the emergency lights of the vehicle, a specific signal is transmitted through a unit of encoding and emittance radio frequency for a

distance of 500/3000 meters approximately, for the warning of intercommunication devices **8** installed in other vehicles found in the area, upon the risk of a chained collision and communicate to a controller **1** on the road sector, the situation of an accident, to operate the special control of speed limit on that section of road (as represented in previous Section 1);

- **8.1.4.** a rolling or rollover sensor already known that, in a situation of overturning of the vehicle or energetic repetitive displacements caused by quick left-right alternative turning maneuvers, transmits a specific signal via a unit of encoding and radio frequency emittance for a distance of 500 meters approximately, for the warning of intercommunication devices **8** installed in other vehicles found in the area, about the risk of chained impact, activating at the same time the emergency lights of the vehicle;
- **8.2. some modules of manual control** for special situations:
  - **8.2.1.** to warn vehicles found in or near the crossing of intersections and other road sectors with poor visibility of the road, the driver of a vehicle can activate a manual control for the broadcasting of a radio frequency code for a distance of 500 meters approximately, warning the intercommunication devices **8** installed in other vehicles found in the area, about the risk of accidents;
  - **8.2.2.** in a situation of unexpected stop of the vehicle, the driver of this vehicle may activate a manual control for the broadcasting of a radio frequency code, warning intercommunication devices **8** installed on other vehicles found in the area, upon the risk of accidents caused by narrowing or block of road lane, activating at the same time the emergency lights of the vehicle;
  - **8.2.3.** in a situation of displacement with a reduced speed because of some special conditions, the driver of this vehicle can activate a manual control for broadcasting a radio frequency code for a distance of 500 meters approximately, to alert

intercommunication devices **8** installed in other vehicles found in the area, about the risk of collision;

- **8.2.4.** if from the opposite direction is approaching a vehicle that improperly uses the lights, the driver of the vehicle can activate a manual control for broadcasting of a radio frequency code, for a distance of 500 meters, warning devices for intercommunication **8** installed in other vehicles being in the area, upon the request to properly use the low beam;
- **8.2.5.** to request medical assistance, the driver of a vehicle can turn on a single-use manual control, to broadcast a coded radio frequency signal over a distance of 500 meters approximately, to warn a devices for intercommunication **8** installed in other vehicles found in the area, and also a device for emergency vehicles **9**, upon the need for medical care, activating at the same time the emergency lights and the horn of distressed vehicle; to discourage the misuse of a manual control for the request of medical assistance, after activation, the shutdown of broadcasting this signal can only be done by receiving a coded signal in radio frequency for a distance of about 30 meters, emitted in accordance with **Fig.1** by a device for emergency vehicles **9** that has arrived to provide assistance, being required special technical assistance for the reactivation of the manual control;
- **8.2.6.** To signal an attack, the driver of a vehicle can turn on a single-use manual control for the broadcasting of a coded signal in radio frequency for a distance of 500 meters approximately, that alerts devices for intercommunication **8** installed in other vehicles found in the area, and also a device for emergency vehicles **9**, about the need for assistance, activating at the same time the emergency lights and the horn of the vehicle found in difficulty; to discourage the misuse of a manual control for signalling aggression, after activation, the shutdown of broadcasting this signal can only be done

by the receipt of a coded signal in radio frequency for a distance of 30 meters approximately, emitted in accordance to **Fig.1** by a device emergency vehicles 9 that has arrived to give assistance, being req technician for the reactivation of the manual control;

- **8.3. a module of encoding and transmitting radio frequency signals;**
- **8.4. a radio frequency receiving and decoding module** for the warning signals received from other devices of the system as in **Fig.1**, which receives the warning signals broadcasted by a controller **1** on a certain sector of road, by devices for intercommunication **8** installed in other vehicles found in the area, by the penalizers **4**, by devices installed on emergency vehicles **9**, by **devices installed in special vehicles** **10**, by portable devices for pedestrians **12** and by cyclists from portable devices for **13**, after receiving and decoding , matching warnings for each code are reported auditory and visual.
- **8.5. a module for auditory playback** of warnings; every warning is realized through speech in the language chosen by the driver of the vehicle; a special module is provided for the use of a intercommunication device **8** on a motorbike, for the warning by hearing speech in helmet of the rider;
- **8.6. a module to present visually** alerts corresponding to the received signals; the reproduction of each visual warning can be realized through some light electro-diodes (LEDs) with special color depending on the nature of the warning, which lights up with intermittent frequency and variable intensity, to show the proximity from the signal source (flicker progressively faster and more intense illumination when approaching the source and progressively slower and weaker lighting when being farther from the signal source), and also by displaying descriptive (text) and / or intuitive (graphical icons) warning on a digital independent display or through the integrated display of the vehicle;

the permanent indication of the direction of travel is achieved through an electronic compass type device (already known), to which is added an indicator for the relative position of the nearest source of radio frequency signal;

**8.7. a structure for amortized rejection** with hydroelectric activation to mitigating the effects of an impact; under the chassis of the vehicle can be assembled hydroelectric activated structures for amortized rejection, in the shape of rigid rods corresponding to the length of front, back and on each side of the vehicle's passenger compartment, provided with groups of proximity sensors, placed at a certain distance one from another, according to the physical dimensions of the vehicle; each sensor is adjusted to detect the presence of an object in the immediate proximity and the approaching of an object with a relative speed greater than a predefined limit considered safe limit for a possible impact; at the time of signal reception, simultaneously, from a minimum number of corresponding group of sensors in an area of the vehicle, a hydroelectric activated structure for amortized rejection comes suddenly from under the vehicle, to absorb an imminent impact, thus avoiding the activation of the structure of rejection by the detection of some small objects (pedestrians, cyclists, animals, packaging, etc.) which should not provoke serious damage;

**8.8.A security power supply auxiliary module** for an intercommunication device **8**; if a power failure to device for intercommunication **8** happens, automatically, through an electronic system already known, the power of a device for intercommunication **8** will be provided by an auxiliary security battery.

**Section 9. A device for emergency vehicles 9**, is a mobile device installed on a vehicle for police, ambulance, fire brigade etc., which comprises the following modules:

- **9.1. a unit for encoding and transmitting radio frequency** that automatically and permanently broadcasts a radio frequency coded signal, different for each type of emergency vehicle which is installed on: police, ambulance, fire brigade etc.; a warning is transmitted to some devices for intercommunication **8**, installed in other vehicles found in the area about the special situation of the traffic, a warning is transmitted to a controller **1** on the area of the road for the special control of the maximum speed allowed when an emergency vehicle is passing; a command is sent for the temporary deactivation of some penalizers **4** in the immediate vicinity of the path followed by the vehicle of intervention;
- **9.2. a unit of radio frequency for receiving and decoding** the signals received from other devices in the system as in **Fig.1**, warns the emergency vehicle's crew when warning signals are being received from **8** intercommunication devices installed in other vehicles found in the area, or when warning signals are being received from a supervisor **3**.
- **9.3 A manual control** which transmits through an unit for encoding and emittance of radio frequency, a coded signal which disables the warnings for requesting medical help or for reporting an assault, issued by intercommunication devices **8** installed in vehicles found in the area, through the use of single-use manual controls;

**Section 10.** A **special device for vehicles 10** , is a mobile device installed on a tram, train, escort vehicle for exceptional loads etc., which comprises a unit of encoding and transmitting radio frequency that automatically and permanently broadcasts a radio frequency code, depending on the type of special vehicle: tram, train, escort vehicle for exceptional loads etc., to warn devices for intercommunication **8** installed in other vehicles found in the area about the special situation in

traffic and to broadcast a radio frequency coded signal to a controller **1** for the special control of the maximum speed permitted on the sector of road.

**Section 11. An automatic engine revolutions regulator 11**, is a mobile device installed on a vehicle; **an automatic controller of the engine revolutions 11** comprises the following modules:

- **11.1. a receiving and radio frequency decoding unit** of the signals received from a controller **1** in respect of the maximum speed permitted on the sector of road, which controls, for a specific signal, a relay, included in the selection module;
- **11.2. a selection module** is installed on the input circuit of the fuel towards the engine of the vehicle; the fuel enters inside a sealed chamber having five output channels respectively encoded: 1/2/3/4/5, provided with electro-valves; each electro-valve is controlled by a relay which receives the signal from a receiving and radio frequency signal decoding unit; the engine of the vehicle receives a predetermined amount of fuel so that the motor does not exceed the preset number of revolutions, to maintain a speed limit;
- **11.3. a security module** automatically intervenes when a pressure drop at the end of the channel normal fuel inlet, or intervenes when a power drop occurs at the terminal of the solenoid in function; the safety module is installed on the input circuit of the fuel towards the engine of the vehicle; the fuel enters inside a sealed chamber having five pairs of channels respectively encoded: 1/2/3/4/5, provided with electro-valves; each electro-valve is controlled by a relay that receives the signal from a receiving unit and radio frequency signal decoding; the safety module includes a power supply circuit for the emergency activities; simultaneously with the closing of the solenoid valve of the inlet channel of the fuel for normal activity, it controls a module for the voice warning;



- **11.4. a module for voice warning** alerts the driver of the vehicle by a voice message that the automatic adjustment of the engine speed continues to work with the emergency circuit, and also on the fact that to solve the problem occurred.

**Section 12. A portable device for pedestrians 12** comprises a unit of encoding and transmission of radio frequency for a distance of 50 meters approximately, which emits, by manual control, an operative warning to some devices for intercommunication **8** installed in vehicles found in the area, about pedestrian's intention of cross a road, or about the presence / movement of pedestrians on the roadside in special situations, as it would be: intersections and blind curves, at night on roads without lighting, weather conditions that restrict visibility, activities of ecological operators etc.

**Section 13. A portable device for cyclists 13** which comprises a unit for encoding and transmission of radio frequency for a distance of 150/250 meters, about controlled manually, which continuously emits a radio frequency code for the warning of some devices to **8** intercom installed in the vehicles found in the area, the presence / movement of a bicyclist on the road.

The following are examples of realization of **modules to punish** in real-time for **penalizer re-4:**

**Example 1. Barrier of mobile nails**, comprises a device placed on a lane, longitudinal, transverse or oblique to the direction of movement, hidden in the road surface, provided with groups of nails of reduced diameter which can be raised, during reception of the signal controlled by a supervisor **3** synchronized according to the speed of the vehicle which will be sanctioned; groups of nails pierce the tires of the vehicle so to cause the slow decline in pressure, avoiding damage to the vehicle driven by the offender and forcing him to stop.

**Example 2. Cannon with paint, or liquid rubber, or other chemicals dyes with fast drying,** comprises a pneumatic device which, upon receiving of the command signal, synchronized according to the speed of the vehicle which will be sanctioned, launches a predetermined amount of paint including one or more colors, or liquid rubber, or other chemicals dyes with fast drying, that permanently marks the vehicle body, therefore obligating the offender to repaint the vehicle;

**Example 3. Sprayer of chemicals with unpleasant smell,** comprises a pneumatic device which, during receiving of the command signal by a supervisor **3**, synchronized according to the speed of the vehicle which will be sanctioned, sprays a predetermined amount of chemical substances with unpleasant odor in the chassis area of the vehicle driven by the offender, harming the public image of the offender or forcing him to pull over and to move away from the vehicle, because of the unpleasant odor.

**By applying the invention should be obtained the following BENEFITS:**

- Road traffic can be adjusted automatically or by human intervention in any regional or local conditions;
- Devices operate either independently or through a modular union under form of automated functional systems;
- Road contraventions are immediately punished, eliminating the risk of causing some serious accidents;
- The subjectivity of the human factor during interventions is avoided (police officers, etc.);
- It avoids irreversible or difficult to repair damage provoked upon the vehicles of offenders,
- The respect for the speed limits and priority in traffic are enforced;

- It prevents and fights immediately the violation of the speed limit when overtaking on areas of road traffic in both directions;
- May be used to block the access in certain areas or may be used for isolating the criminals in traffic;
- The system can also be used by drivers of cars with hearing impairments;
- Increases in traffic safety and dynamics;
- Reduces fuel consumption and pollution;
- Eliminates the competitive tendencies of drivers;
- Determines the self belief in responsible behavior for participants in traffic: drivers, pedestrians and cyclists;
- Offenders are discouraged and operatively neutralized;
- Offenders suffer drawbacks of a personal nature directed directly against them, such as loss of time, through the temporary immobilisation of the vehicle, and also by attracting the traffic participants' attention upon the offender, which affects his public image;
- Increases the attention of all participants in traffic: drivers, pedestrians and cyclists;
- All traffic participants are benefiting from the sense of security;
- The effect is achieved without requiring additional punitive effort, unsustainable by the society.

## CLAIMS

**Claim 1.** Modular system for active safety, able to work fully automatic, comprising electronically controlled devices, able to comply with specific conditions for urban road networks and extra-urban road networks, **characterized in** that it is formed by functional aggregation of devices installed in some road sectors, some devices installed in vehicles and some portable devices used by pedestrians and cyclists, all these devices being interconnected via radio frequency, forming a proprietary network or using an existing communication network.

**Claim 2.** Controller (1) is a fixed electronic device installed according to Claim 1, on a road sector, **characterized in** that it sets the maximum speed allowed on the sector of road as a function of repetitive, meteorological or occasional conditions, where an operative decongestion of road traffic is needed; the determination of repetitive conditions is achieved through programming an automatically timed unit by: day / night operation, working days / weekends, hours of heavy traffic, other repetitive conditions determined by the specific local road traffic;

the permanent monitoring of the weather conditions is accomplished through some heat and humidity sensors; an optical sensor identifies the situations with poor visibility: snow, fog, rain; a temperature sensor indicates the possibility of ice formation on the surface of the road;

a humidity sensor identifies the situations which provokes reduced grip on the road: rain, snow; a unit for receiving and decoding radio frequency signals from other devices. in the system, identifies the occasional situations on the road sector, as would be: occurrence of accidents, the momentary increase of the intensity of traffic, special operations, carrying out some maintenance work on the road etc.; when traffic needs more fluidity due to some special situations, an unit for coding and emission in radio frequency transmits individualized signals to each traffic lights with progressive warning (6) set on a traffic lane of a sector of the road, so to extend with predefined periods of time, the default priority given to vehicles that are moving on the traffic lane controlled by the traffic light; a unit for coding and radio frequency emission

broadcasts continuously, for a distance of minimum 300 meters in urban areas, and minimum 700 meters in rural areas, a set of signals including the maximum speed allowed and the condition: legal, local, meteorological or special that determines the limit.

**Claim 3.** Panel (2) is a fixed electronic device installed according to Claim 2, on a road sector, **characterized in** that it alerts participants to road traffic, according to the encoded signals emitted from a controller (1) which are being received through the radio frequency receiving and decoding unit; information comprises maximum speed allowed on the sector of road, together with the description of conditions that impose the speed limit statement, in the form of text and / or via intuitive graphical icons, are presented with a display unit with the adequate size to be easily observed and interpreted by drivers of vehicles.

**Claim 4.** Supervisor (3) is a fixed electronic device, installed according to Claim 1, on a road sector, **characterized in that** the fact that it observes permanently the traffic following a traffic lane or in both senses on a road sector, with the help of some already known cameras for monitoring traffic in single sense or both senses; when a vehicle passes in front of the camera, a counting unit already known transmits to the controller (1) a radio frequency encoded signal to determine the risk of traffic congestion, the speed of each vehicle that travels on the lane is verified by a device that measures the velocity, already known; a control unit compares the monitored speed of each vehicle with the speed limit set for that segment of road, which it constantly receives from a controller (1); if the monitored vehicle speed is higher than the maximum limit allowed on the sector of road, a module for encoding and transmitting radio frequency, for a time synchronized with the moving speed of the vehicle, triggers a specific penalizer (4) so to apply a sanction on the vehicle driven by the offender.

**Claim 5.** Penalizer (4) is a fixed electronic device, installed according to Claim 1 on a road sector, **characterized in** that it punishes an offender in real time, during a specific triggering signal received from a supervisor (3) via a radio frequency receiving and decoding

unit.

**Claim 6.** Mobile nails barrier, according to claim 5, **characterized in** that a lengthwise device is placed on a lane, transverse or oblique to the direction of travel, hidden nearby the road surface, provided with groups of small-diameter nails that can be raised during receiving the triggering signal from a supervisor (3), synchronized depending on the speed of the vehicle that will be sanctioned; groups of nails pierce the tires of the vehicle so as to cause the slow decline in pressure, avoiding damage to the vehicle driven by the offender and forcing him to pull over; unit of coding and radio frequency emitting transmits a signal to warn devices for intercommunication (8) installed in other vehicles found in the area, about the reduction of speed on the sector of road.

**Claim 7.** Camion with paint, liquid rubber or other chemical dyes with fast drying, according to claim 5, **characterized in** that it receives a command signal from a supervisor (3), synchronized depending on the speed of the vehicle to be punished; upon receiving the triggering signal, a pneumatic device launches a predetermined amount of special colored paint or including one or more liquid rubber or other chemical dyes with fast drying, that permanently marks the vehicle body, therefore obligating the offender to repaint the vehicle.

**Claim 8.** Sprayer of chemicals with unpleasant smell, according to claim 5, **characterized in** that it is provided with a pneumatic device which, upon receiving the triggering signal from a supervisor (3), synchronized with the speed of the vehicle that will be sanctioned, sprays a predetermined amount of chemicals with unpleasant odor in the chassis area of the vehicle driven by offender, harming the public image of the offender or forcing him to pull over and to move away from the vehicle, because of the unpleasant odor.

**Claim 9.** Barrier for one-way street (5) according to claim 1, installed on a road sector, at leaving of a one-way street, **characterized in** that requires compliance with a sense of moving by using a rocker assembly, having a flat top surface which allows the passing of the vehicles

driving in the right sense; the top flat surface is mounted on a system of hinges; the edge of the rocker assembly which is oriented against the regular sense of driving, comprising sharpened tops, remains slightly elevated through elastic tensioners, so that if a vehicle comes from the opposite direction than the regular one, tires of vehicle will be perforated so the pressure is lost immediately; when a vehicle enters from forbidden sense, a switch commands a particular signal through an unit for coding and radio frequency emitting, alerting devices for intercommunication (8) installed on other vehicles found in area, about the risk of accident due to the intrusion of a vehicle on forbidden sense.

**Claim 10.** Traffic lights with progressive warning (6) installed according to claim 1 on a road sector, **characterized in** that comprises modules with warning light green, yellow and red, located in three places; the green light warning module is located within 50 to 150 meters before the place where a driver has to give way. the distance being chosen so that a vehicle moving at speeds within the limits allowed on the road sector should be able to pass safely through the crossing; the green light comes on so long that there is a priority lane traffic controlled by traffic lights and goes out some time before the priority is loosened on the lane controlled by traffic lights, so that a vehicle that travels within the speed limits allowed on road sector to be able to stop safely before the red light warning module; the yellow light warning module is set at about half the distance between the green light warning module and the place where it might be needed to give priority, the distance being chosen according to the prevailing speed on that segment of road; the yellow light comes on with an interval of time before the time that priority is loosened on the lane controlled by traffic lights, time enough so that a vehicle that travels within the speed limits allowed on road sector, to be able to stop safely, before the red light warning module; the yellow light goes off at the same time with the priority recovery for vehicles on the lane; the red light warning module is located in the place where it might be needed to give priority; the red light comes on at the same time with the loss of the priority on lane; the red light goes off with

the priority recovery for vehicles on the lane; a unit for radio frequency is receiving and decoding the control signal emitted by an individual controller (1) that may extend the time of the priority accorded to vehicles, with predetermined intervals depending on the intensity of traffic so to fluidize the lane controlled by traffic lights; in special situations, a unit is receiving and decoding radio frequency signals emitted by a device for emergency vehicles (9), which prolongs the time of passage previously granted to vehicles until after the exit of the emergency vehicle from the road sector; an unit for coding and radio frequency output transmits a signal specific to a certain shield for pedestrian traffic (7), to synchronize the traffic lights with progressive warning (6);

to increase the attention of drivers of vehicles in the area of pedestrian crossings and to prevent the access of vehicles on the sidewalk, the distance between the position of the green light module and the position of the red light module can be provided with furnishings of the border channels under the guise of "V", having a sloping side towards the road and a side perpendicular to the surface of the sidewalk; the maximum depth of a channel will be at least equal to the radius of the tires mounted on most vehicles that are usually travelling on the road sector.

**Claim 11.** Shield for pedestrian traffic (7) according to claim 1 installed on a road sector, **characterized in** that it is synchronized via a radio frequency receiver and decoding module with the signal emitted by a traffic light with progressive warning (6) or through a module for gathering signal from a classical traffic light, through an appropriate interface; a pair of automatically controlled barriers stop vehicle access in the area of pedestrian crossings with traffic lights, for as long as the priority given to pedestrians; some presence sensors, already known, determine whether the pedestrian crossing has cleared, to prolong the time of priority given to pedestrians if needed, promoting the safe passage of slowly moving people, as would be: persons accompanying children, people with physical disabilities, etc.; to increase attention to drivers of vehicles in the area of pedestrian crossings and to prevent the access of vehicles on the



sidewalk, the area of road where the shields are installed for pedestrian traffic can be provided with furnishings of the border channels under the guise of "V", having a sloping side towards the road and a side perpendicular to the surface of the sidewalk; the maximum depth of a channel will be at least equal to the radius of the tires mounted on most vehicles that are usually travelling on the road sector.

**Claim 12.** Device for intercommunication (8) is a mobile device installed according to claim 1 in a vehicle, **characterized in** that it ensures the operation, all the time during activation of starting contact of vehicle, some special sensors for continuous monitoring of the vehicle, some modules of manual controls for special situations, some modules for emitting and receiving in radio frequency and decoding the signals received from other devices in the system, and a module for visually presenting alerts corresponding to signals received, and a hydroelectric activated structure for amortized rejection which is mitigating the effects of an impact; while the progressive reduction of the speed of the vehicle after a long braking, an inertial sensor already known commands the emission of a radiofrequency code for a distance of 150 / 500 meters approximately, to warn devices for intercommunication (8) installed in other vehicles found in the area, about the risk of formation of sudden queues or traffic jams, at the same time also activating the emergency lights of the vehicle; while the immediate slowdown in speed caused by a sudden braking, an already known inertial sensor commands the emission of a radio frequency code for a distance of 150 / 500 meters approximately, to warn intercommunication devices (8) installed in other vehicles found in the area, about the risk of impact, at the same time also activating the emergency lights of the vehicle; in situation of an accident, a number of impact sensors are already known, configured to receive correspondence in frontal, side and rear impacts on the vehicle, activate the emergency lights of the vehicle, while repeatedly commands the emission of a radio frequency code for a distance of 500 / 3000 meters approximately, to warn devices for intercommunication (8) installed in other vehicles found in

the area, about the risk of a chained collision and to communicate to a controller (1) on the road sector, the situation of an accident, to be able to operate the special control of the speed limit on that road sector; in situation of displacement or tilting of the vehicle caused by repetitive forceful and alternative left-right quickly maneuvers, a rolling or tipping sensor already known controls the instantaneous release of a radiofrequency code for a distance of 500 meters approximately, to warn devices for intercommunication (8) installed in other vehicles found in the area, about the risk of chained impact, activating the same time the emergency lights of the vehicle; to warn the vehicles found in or near to the crossing of intersections and other road sectors with poor visibility, the driver of a vehicle can activate a manual control for the broadcasting of a radio frequency code, for a distance of 500 meters approximately, to warn devices for intercommunication (8) installed in other vehicles found in the area, about the risk of accidents; in situation of an unexpected stop of the vehicle, the driver of this vehicle may activate a manual control for the broadcasting of a radio frequency code, for a distance of 500 meters approximately, to warn devices for intercommunication (8) installed on other vehicles found in the area, about the risk of accidents caused by narrowing or block of the lane, turning at the same time the emergency lights of the vehicle; in situations of displacement with a reduced speed because of some special conditions, the vehicle driver can activate a manual control for broadcasting of a radio frequency code, for a distance of 500 meters approximately, to alert devices for intercommunication (8) installed in other vehicles found in the area, about the risk of collision; if from the opposite direction is approaching a vehicle that improperly uses the lights, the driver the vehicle can activate a manual control for broadcasting of a radio frequency code, for a distance of 500 meters approximately, that alerts devices for intercommunication (8) installed in other vehicles found in the area, on the request to properly use the low beam; to request medical assistance, the driver of a vehicle can turn on a single-use manual control, to broadcast a coded signal, for a distance of 500 meters approximately, to warn a radio

frequency controller (1) on certain sector of the road, and also devices for intercommunication (8) installed on other vehicles found in the area, about the need for medical care, at the same time also activating the emergency lights and the horn of the distressed vehicle; to discourage the abusive use of a manual control for requesting medical assistance, after activation, the shutdown of broadcasting this signal can only be done by receiving a coded radio frequency signal, for a distance of 30 meters approximately, from a device for emergency vehicles (9) that has arrived to give assistance, being required specialized technical assistance for the reactivation of the manual control; to signal an attack, the driver of a vehicle can turn on a single-use hand control for the broadcasting of a coded radio frequency signal, for a distance of 500 meters approximately, that alerts a controller (1) on certain road sector, and also devices for intercommunication (8) installed in other vehicles found in the area, about the need for assistance, at the same time also activating the emergency lights and horn of the vehicle in distress; to discourage the misuse of a manual control for signaling aggression, after activation, the shutdown of broadcasting this signal can only be done by the receiving a coded radio frequency signal, for a distance of 30 meters approximately, emitted by a device for emergency vehicles (9) that has arrived to give assistance, being required specialized technical assistance for the reactivation of the manual control; radio frequency unit is receiving and decoding signals of warnings from a controller (1) on certain road sector, from penalizers (4), from devices for intercommunication (8) installed in other vehicles found in the area, from devices installed on emergency vehicles (9), from special devices installed on vehicles (10), from portable devices for pedestrians (12) and from portable devices for cyclists (13); after receiving and decoding, corresponding warnings are reported auditory and visually; auditory playback of each warning is accomplished through speech in the language preferred by driver of the vehicle; the visual reproduction of each warning can be realized through some electro-light emitting diodes (LEDs) with special color depending on the nature of the warning, which lights intermittently with

varying frequency and intensity, to detect the proximity from the source signal (light flicker progressively faster and more intense while rapprochement of the source and progressively slower and weaker when moving away from the source of the signal), and also by displaying descriptive (text) and / or intuitive (graphical icons) warning on a digital independent display or via integrated display of the vehicle; permanent indication of moving direction is achieved through an electronic compass type device, already known, to which is added an indicator for the relative position of the nearest source radio frequency signal; for the use of a device for intercommunication (8) on a motorbike, a special module is provided for the warning auditory speech through the helmet of the motorcyclist; under the chassis of the vehicle can be assembled hydroelectric activated structures for amortized rejection, in the shape of rigid rods corresponding with the front, the rear and the sides of the vehicle's binnacle, provided with groups of sensors installed on front, rear and on sides of the vehicle, placed at a certain distance from each other according to the physical size of the vehicle, each sensor being set to indicate the presence of an object in the immediate proximity and the approach of an object with a relative speed greater than a predefined limit considered safe for a possible impact, so that when the signal is received simultaneously by a minimum number of corresponding group of sensors in an area of the vehicle, a hydroelectric activated structure for amortized rejection comes suddenly from under the vehicle to absorb imminent impact, thus avoiding the activation of the structure of rejection by the detection of some small objects (pedestrians, cyclists, animals, packaging, etc.) which should not provoke serious damages; if a power failure to device for intercommunication (8) happens, automatically, via an electronic system already known, the power of a device for intercommunication (8) will be provided by an auxiliary security battery.

**Claim 13.** Device for emergency vehicles (9), is a mobile device installed according to claim 1 installed on a vehicle for police, ambulance, fire etc., **characterized in** that automatically and permanently broadcasts radio frequency signals encoded differently depending on the type

of intervention vehicle on which it is installed: police, ambulance, fire etc., to warn devices for intercommunication (8) installed in other vehicles found in the area, about the special situation in traffic, to inform a controller (1) on the road sector about the special control of the speed limit allowed, and also to temporary disabling of penalizer (4) in the immediate vicinity of the path of action of the emergency vehicle; if in the area of a patrolling emergency vehicle, a supervisor (3) commands to penalizer (4) the application of a sanction, a module of receiving and decoding radio frequency alert the emergency crew and provides location of the vehicle driven by offender, making possible an eventual additional penalty or to ensure the trailer; a manual control is provided, emitting a coded signal which disables the warnings for requesting medical help or for reporting an assault, issued by devices for intercommunication (8) installed in vehicles found in the area, through the use of single-use manual controls.

**Claim 14.** Device for special vehicles (10), is a mobile device installed according to claim 1 on a special vehicle: bus, train, etc. escort for special transports, **characterized in** that it permanently and automatically emits a radio frequency code, depending on the type of special vehicle: tram, train, escort for special transports, etc., to warn devices for intercommunication (8) installed in other vehicles found in the area about special situation and to control the special speed limit allowed on the road sector.

**Claim 15.** Automatic engine revolutions regulator (11), is a mobile device installed according to claim 1 in a vehicle, **characterized in** that it receives and decodes signals from a controller (1) regarding the maximum speed allowed on the road sector and, through a relay, commands the opening of a valve installed in a channel input fuel for normal work, located on the input circuit of the fuel to the engine of the vehicle; the fuel enters into a sealed chamber having 5 pairs of channels encoded 1/2/3/4/5 which transmit to the motor of vehicle a predetermined amount of fuel so that the motor does not exceed preset revolutions, to maintain a speed limit; when an output of the channel pressure drop normal input of fuel or a power failure

occurs at the terminal of the solenoid in operation, automatically will open a security module consisting of a sealed chamber having 5 pairs of channels encoded 1/2/3/4/5 which transmit to the motor of vehicle a predetermined amount of fuel so that the motor does not exceed preset revolutions, and a power supply for emergency activities, simultaneously with the closing of the solenoid valve on the input channel of the fuel for the normal activity; the driver of the vehicle is warned by a voice message that the automatic adjustment of the engine speed has been disabled and the engine continues to operate using the security module, and also on the fact that to solve the problem occurred.

**Claim 16.** Portable device for pedestrians (12), according to claim 1, **characterized in** that it allows manual control of broadcasting a radio code for a distance of 50 meters approximately, to operatively warn devices for intercommunication (8) installed in vehicles found in the area, about pedestrian's intention to cross a road or about the presence / movement of pedestrians on the roadside in special situations, as it would be: intersections and blind curves,, at night on roads without street lighting, or during weather conditions that limit visibility, activities of ecological operators etc.

**Claim 17.** Portable device for cyclists (13), according to claim 1, **characterized in** that it constantly broadcasts a radio frequency code for a distance of 150/250 meters approximately, to warn devices for intercommunication (8) installed in vehicles found in the area, about the presence / movement of a cyclist on the road.

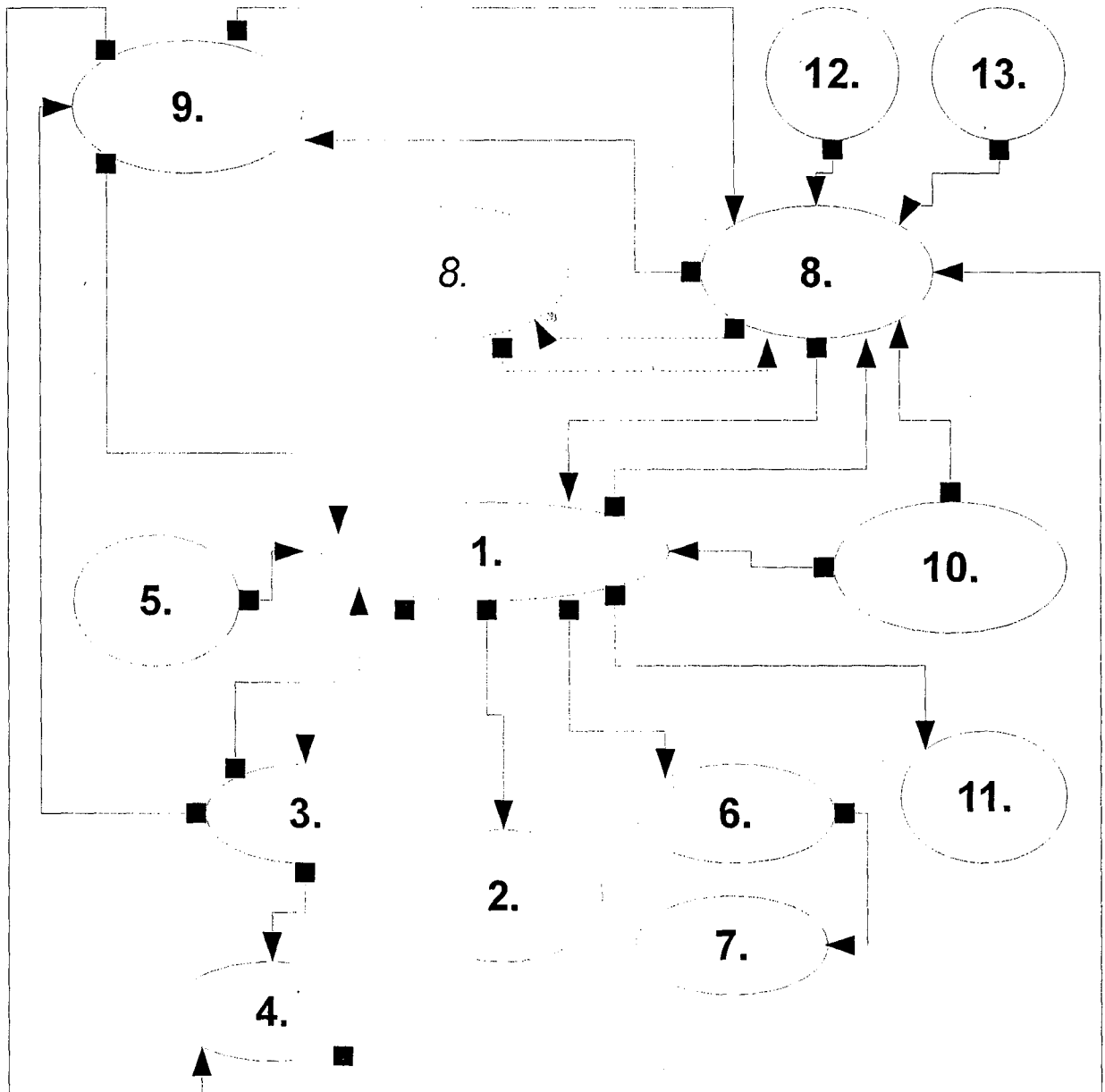


Fig.1.