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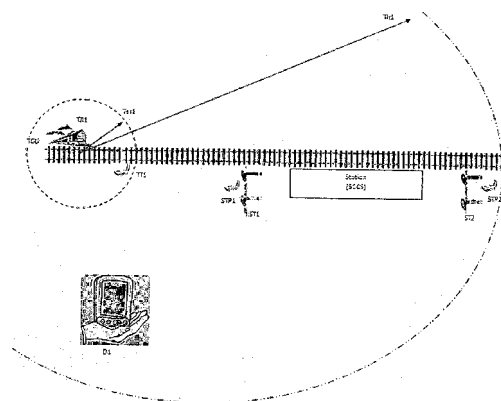


FIG.1

(57) Abstract: The invention relates to a railway signalling system used to control and manage the railway traffic. More particularly, the invention relates to an obstruction independent persistent signaling system to control and manage railway traffic. The system is devised to obviate the problems relating to accurate detection of the remotely situated signals which may arise due to many reasons like reduced visibility in certain seasons, technical faults, human errors and alike.

OBSTRUCTION INDEPENDENT PERSISTENT SIGNALLING SYSTEM

FIELD OF THE INVENTION

5 The invention relates to a railway signalling system used to control and monitor the railway traffic. More particularly, the invention relates to an obstruction independent persistent signaling system to control and manage railway traffic. The system is devised to obviate the problems relating to accurate detection of the remotely situated signals which may arise due to many reasons like reduced visibility in certain seasons, technical
10 faults, human errors and alike.

BACKGROUND OF THE INVENTION

Railway signalling system is used to control and manage railway traffic safely, essentially
15 to prevent trains from colliding, and other such miss happenings. Trains are uniquely susceptible to collision as they are guided by fixed rails; furthermore, trains cannot stop quickly, and frequently operate at speeds beyond the limits under which it can be suddenly put at halt. Most forms of such signalling systems involve transmitting authority from those responsible for each section of a rail network (e.g., a signalman or
20 stationmaster) to the train crew.

There are various types of signalling systems known in the art. For example, mechanical signal system like semaphores, colour light signal system etc. In most of the signalling systems, physical signals are positioned at the line-side as indicators to drivers depicting
25 as to whether the line ahead is clear or otherwise; and to ensure a sufficient and substantial distance is maintained between trains before they are allowed to enter a particular section on the track.

Semaphore signals are the traditional signals seen widely throughout the country. Each signal has an assembly with an arm mounted on a mast. The arm can move through two or three different positions at different angles, each position providing a distinct signaling aspect. The most prevalent semaphore signals used include two-position lower-quadrant. Lately, the introduction of power signaling equipment in some areas leads to introduction of three-position upper-quadrant signaling system.

Color-light signals are assemblies of lamps that indicate different aspects by means of different colors of lamps that are lit. In recent years many older semaphore signals have been replaced by color-light signals. Position-light signals are assemblies of lamps where the signal aspect is indicated not by color but rather by the combination of the lamps that are lit.

Yet another class of signals is the Disc Signals which are in the form of a vertical disc with a pattern such as a bar painted on it, which rotates about its centre to different positions to indicate different signal aspects. These are usually mounted on poles but may be close to ground level.

Thus ordinarily, the driver or any other assistant personnel like guard of locomotive is required to see (through the driver or any other personnel like guard) from a point before the signal's physical installation on ground. There are chances that the personnel responsible in the moving vehicle or locomotive may "miss" seeing the signal, either due to human error/mistake or due to obstruction like fogs, smog, haze and/or signal malfunction etc., and if the vehicle or locomotive moves past the location of the signal, then there is no way to notice the signal.

On certain instances of improving upon the above issue of inability of visual signal notification, there are attempts made to inform the driver or the guard about the

location of the signal by the use of bursting of crackers or GPS based location information. Yet these systems are only enabling the driver to be still dependent on their visual capabilities to physically check the signal. It does not actually solve the problem of the obstruction to visibility of the signal due to various reasons mentioned
5 herein.

Anti-collision systems based on GPS are also proposed in literature. However, such systems which are based on only GPS lack in accuracy because it is very difficult to locate beyond tolerances of 5meters using GPS, which is inadequate for high complexity
10 junction station where there several lines are present crisscrossing each other as part of a planned layout of the track.

Currently, there is no such capable system that enables driver or guard of the running train to clearly visualize the signal during fog, smog or haze and is majorly dependent on the visual capability of the running train staff. Further, there is a need for such system
15 which enables running train staff as well as individual station staff to clearly coordinate with the signal status irrespective of any human error or obstruction due to fog, smog, haze and/or signal malfunction etc., which is required for a free flow movement of trains without the risk of any collision.

20

OBJECT OF THE INVENTION

The principal object of this invention is to provide an Obstruction Independent Persistent Signaling System

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Another object to this invention is to minimize the risk of collision between the running trains.

A further object of this invention is to minimize the visual limitation of signal staffs or running train driver or guard.

A further object of this invention is to provide a system to completely overcome the situation of delay arrival or departure of trains during the fog, smog or haze.

5

A further object of this invention is to provide a reliable continuous obstruction free signalling system.

10

A further object of this invention is to provide an improved system and method to control the entire railway traffic.

A further object of this invention is a user friendly obstruction independent persistent signalling system.

15

A further object of this invention is to provide a low cost, very effective automatic collision prevention system.

A further object of this invention is to provide real time location specific services to the onboard commuters and passengers.

20

SUMMARY OF THE INVENTION

The invention relates to a railway signalling system used to control and manage the railway traffic. More particularly, the invention relates to an obstruction independent persistent signaling system to control and manage railway traffic. The system is devised to obviate the problems relating to accurate detection of the remotely situated signals which may arise due to many reasons like reduced visibility in certain seasons, technical faults, human errors and alike.

The invention further relates to a method and integration of multitude of hardware and software placed in areas like inside driver cabin, railway tracks, railway stations etc. The multitude of hardware communicates using radio frequency signals using but not
5 limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and Passive Radio Frequency Identification (RFID) etc. Additionally, the invention provides for an acknowledgement input mechanisms in the form of, but not limited to, switches, touch screen, voice active
10 commands etc. The said acknowledgement mechanism ensures that the driver has actually received the signal and has accepted it for taking actions as required.

The invention accordingly comprises several steps and relation of one or more of such steps with respect to each of the others, and the various features of construction,
15 combinations or elements and arrangement of parts which are adapted to effect such steps, all is exemplified in the following detailed disclosure, and the scope of the invention is indicated in the claims.

20 BRIEF DESCRIPTION OF THE DRAWINGS

For a complete understanding of this invention, references are made to the following description taken in connection with the accompanying drawings, in which:

25 FIG. 1 is a complete communication system for obstruction independent persistent signalling system.

FIG. 2 is another view of complete communication system for obstruction independent persistent signalling system.

EMBODIMENTS OF THE INVENTION

5 In a preferred embodiment of the present invention, an obstruction independent persistent signalling system is disclosed wherein the said system comprises of:

- a. at least one Radio Frequency Transponder installed on the train;
- b. at least one control unit installed on the train to communicate the signals;
- 10 c. two or more station transponders;
- d. one or more computer control server installed at station;
- e. two or more signal towers;
- f. one or more display units;
- g. one or more alarm units;
- 15 h. one or more track ID transponders;
- i. one or more GPS tracking modules; and
- j. one or more 2G/3G/4G wireless, mobile messaging modules;

In another embodiment of the proposed invention the radio frequency transponders on the arriving train transmit signals controlled by control unit installed on the train.

In still another embodiment of the proposed invention a system of said multiple station transponders receive signal from the transponders of arriving train and transmits the signal to the said station computer control server.

25 In still another embodiment of the proposed invention the station computer control server in turn transmits the required signal to signal towers automatically or through manual intervention.

In still another embodiment of the proposed invention the station computer control server further transmits the required signal data to the display units and alarm units installed on the train as well as station automatically or through manual intervention.

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In another embodiment of the proposed invention the said Radio Frequency Transponders installed on the train are in communication with the said control unit installed on the train; the said transponders have unique identity number specific to each train; and the said transponders are installed on front and rear dash boards; or top
10 or side of the engine and guard cabin; or as per the requirements.

In still another embodiment of the proposed invention the said control unit installed on the train is a multitude of hardware and software placed inside driver cabin and/or guard cabin; the said control unit communicates using radio frequency signals using but
15 not limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and Passive Radio Frequency Identification (RFID) etc.; the said control unit provides for an acknowledgement input mechanisms in the form of, but not limited to, switches, touch screen, voice active
20 commands etc.

In another embodiment of the proposed invention the said station transponders are installed on every track of a particular station; each of the said station transponders on each track have a unique track identity number; the said station transponders are in
25 communication with the said computer control server installed at station.

In another embodiment of the proposed invention the said track ID transponders are located on railway track and broadcast the track ID continuously at a predetermined interval for the train moving on top of it to capture the data.

In still another embodiment of the proposed invention the said computer control server
5 installed at station is a multitude of hardware and software placed inside driver cabin and/or guard cabin; the said computer control server communicates using radio frequency signals using but not limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and
10 Passive Radio Frequency Identification (RFID) etc.; the said computer control server provides for a feedback signal input mechanisms in the form of, but not limited to, switches, touch screen, voice active commands etc.

In still another embodiment of the proposed invention the signal towers located at
15 station comprise radio frequency transponders having unique location Identity number and visible signalling means like signal lights, Light Emitting Diodes and other such devices known in the art; and wherein, each of the said transponders on signal towers continuously broadcast data on a predetermined interval. The said broadcast data includes, but not limited to, its identity, signal data i.e. go (green) or stop (red), data like
20 which train this signal is for (as decided by the control computer at the station depending on the pre known schedules), recommended speed for the train moving past the station, stop durations if any, when did the last train left the same track and platform in the station and at what time so that the driver gets all this info on a screen before train reaches the station.

25

In another embodiment of the proposed invention the signal towers located at station are in communication with computer control server installed at station; the signal towers display feedback signal as red, green, or yellow as provided by the computer

control server; the signal towers further transmit these signals to the transponders installed on the train; and wherein the said communication cycle is independent of visibility factors and signals are viewed even in absolute zero visibility due to adverse climatic conditions like fog, rain, smog, haze, snow etc.

5

In still another embodiment of the proposed invention the said display unit comprises visible signalling means like signal lights, Light Emitting Diodes and other such devices known in the art; the said display unit is installed at station, and on front and rear dash boards of the engine and guard cabin; and the display unit displays information
10 regarding station and platform number which may further be transmitted to the passengers on board through visible or audible announcements.

In another embodiment of the proposed invention the said alarm unit comprises audible messaging means; the said alarm unit is installed at station, and on front and rear dash
15 boards of the engine and guard cabin; and the said alarm unit alarms the personnel about fault, tamper at any level; or missed acknowledgement of signals at any level; or missed feedback signal at station level; or in case of any catastrophe.

20 In another embodiment of the proposed invention anti collision mechanism is initiated by the control unit installed on trains and an alert through display unit or alarm unit is activated whenever the transponders on the trains transmit/receive signals broadcasting same unique track ID from another train.

25 In yet another embodiment of the proposed invention, disclosed is a method of obstruction independent persistent signalling comprising the steps of:

- a. track ID transponders on railway track broadcast track ID;
- b. the broadcast data of step a. is received by transponders on train;

- c. the radio frequency transponders on the train broadcast data received in step b. along with data including, but not limited to, unique ID number corresponding to the train, speed of the train etc.;
- d. a system of multiple station transponders receive data of step c. and broadcast the same;
- e. the data of step d. is sent to the said station computer control server;
- f. the station computer control server in turn transmits, automatically or through manual intervention, the required data to signal towers i.e. go (green) or stop (red), data like which train this signal is for (as decided by the control computer at the station depending on the pre known schedules), recommended speed for the train moving past the station, stop durations if any, when did the last train left the same track and platform in the station and at what time;
- g. the signal transponders receive and broadcast the data of step f.;
- h. the data broadcasted in step g. is received by train transponders and the driver gets all this information on a screen before train reaches the station;
- i. the received data in step h. is acknowledged by input mechanisms present in train in the form of, but not limited to, switches, touch screen, voice active commands etc.;
- j. the acknowledgement data in step i. is broadcasted by train transponders which is then received by signal transponders;
- k. the signal transponders broadcast the data received in step j. which is then received by station transponders;
- l. the station transponders broadcast the data received in step k. which is transmitted to the station computer control server; and
- wherein, if no acknowledgement data is transmitted as in steps i.-l. above, the station computer control server transmits the required signal data to activate alarm units installed on the train as well as station automatically or through manual intervention.

In another embodiment of the proposed invention all signals and actions taken are logged for any later requirement or assessment.

DESCRIPTION OF THE INVENTION

5

The invention relates to a railway signalling system to control and manage the railway traffic. More particularly, the invention relates to an obstruction independent persistent signaling system to control and manage railway traffic. The system is devised to obviate the problems relating to accurate detection of the remotely situated signals which may arise due to many reasons like reduced visibility in certain seasons, technical faults, human errors and alike.

In a preferred embodiment of the invention, the obstruction independent persistent signaling system comprises a multitude of hardware with associated firmware running on the hardware to make signaling possible even when visibility is absolute zero. These hardware/software devices are going to be placed, but not limited to, in areas like inside driver cabin, railway tracks, railway stations etc. The said integrated multitude of hardware communicates using radio frequency signals using but not limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and Passive Radio Frequency Identification (RFID) etc.

In another embodiment of the invention, the system further comprises software(s) with custom or standard protocols that control and manage the said multitude of hardware from central packets of control management suites.

Another embodiment of the invention provides the driver of the locomotive a visual and audio indication of the signal of the route of the currently driven locomotive inside the

cabin of the driver in his dashboard. The signal is shown on the desktop or control display area of the locomotive with assisting audio signals. In another aspect of the invention, the signal thus displayed is available to the driver even after the physical location of the origin of signal is well moved past until such distance it is considered to
5 be important. Additionally, the invention provides for an acknowledgement input mechanisms in the form of, but not limited to, switches, touch screen, voice active commands etc. The said acknowledgement mechanism ensures that the driver has actually received the signal and has accepted it for taking actions as required.

10 In another embodiment of the invention, all signals and actions taken are logged for any later requirement or assessment.

The invention further provides a novel concept of "Persistent Signaling" in vehicles and locomotives. It is thus proposed through this disclosure, the signal, instead of being
15 placed & shown outside the vehicle or locomotive, it is to be transmitted using strategically located transponders directly in the dashboard of the driver through signal lights, track route maps, color LEDs or information display on LCD with or without touchscreen, and persisting the signal in the dashboard even when the signal is no longer visible or not in range.

20 One of the main advantages of this approach is that the driver is no longer required to look outside the window for the signal light, instead receives the information through signal light on the dashboard. Since the signal is not prone to performance degradation as it is not obstructed by fog or other visibility problems as it is being transmitted over radio frequency, there is no chance of "missing" the signal in adverse visibility
25 conditions. Further, since there is a provision of the signal acknowledgement by the driver being ensured electronically, will firmly establish that the driver has acknowledged the signal and taken responsibility to work on it as appropriate. This will remove any ambiguity from the driver's part that they have actually seen the signal

correctly. In case the driver does not acknowledge the signal on the dashboard, then the system will alert him by a change in the screen as a message possibly also with audio message or alarm of the pending signal or in some cases, they may even be alerted to station officials, including the guard, that a certain train has not acknowledged a signal on a particular route. This will in turn help the station officials to avoid any impending collisions, by making sure that the route is clear till such time that the real problem of non-acknowledgment is resolved. This will continue till such time it is deemed necessary by the rules governing the railway, e.g. till the next signal comes.

Both correct actions as well as violations by the driver are logged for future processing. The transponders are capable of being placed in complete compatibility with existing signaling systems so that there is no disruption of the current legacy signaling system. Since the transponders are located in strategic locations, they can serve the purpose of real time location specific services like informing commuters and passengers on the next station names, arrival times and any delays etc.

Further, the transponders have specific ID numbers, making the trains eventually broadcast this information on their track ID and eventually extend the system's functionality to an effective collision avoidance system. Such transponders can have all standalone power capabilities to keep running for sufficient times in case of power outages without disrupting the signaling services.

In another embodiment of the invention, it is stated that the train movement sensor network can be easily layered on top of this infrastructure in such a way that it can provide a very effective automatic collision prevention system, such that it complies with all the requirements as well as provides a cost effective alternative to the current Anti Collision Device of the Railways and provide additional safety measures.

WORKING SEQUENCE

Each train TR1 is fitted with a Radio Frequency (RF) Transponder TRF1 and a Control Unit TCU1 to communicate with the signal and its associated system wirelessly. Within
5 the wireless system, there are two modes of operation. One mode is for short distance, and another for long distance communications. The effective radius of the short distance mode is shown as Tsr1 and the effective radius of communication for the long distance mode is shown as Tlr1 as displayed in Fig1.

10 Whenever a train is to be signalled, the person at the station will take decisions and actions in the form of pulling a lever or button or executing programs on computer through software etc, which results in the outcome of lights or visual signs for the train driver to see and act upon at the signal towers ST1 and ST2. For example, such actions will make the signal lamp glow red to stop, green for go.

15 Additional to this legacy act, the action itself is captured by a system of sensors and actuators by a complex computer hardware and software marked as SCCS (Station computer control system). The system then creates an applicable RF signal to be transmitted to the transponder STP1 and STP2 through the use of wired or wireless
20 communication. The signal from SCCS is stored at STP1 and STP2 and it is broadcasted at a pre-decided interval, say every 1 second. Each transponder STP1 and STP2 have their own location ID. Apart from the signal, it also broadcasts their location ID.

Before the approaching distance of the signalling transponder, there track ID
25 transponder TT1. These transponders broadcast the track ID continuously at a predetermined interval, say 1 second. These transponders have a transmitting range of only few feet. These transponders are in the middle of the tracks, i.e. directly below the moving train.

When the train is approaching a station, it first comes in the range of the track transponder TT1. As soon as it moves over the track transponder, it updates its track ID and stores it in the TCU.

- 5 As the train approaches further the station, it moves near the signal Transponder STP1 (or STP2 as the case may be depending on the direction). While being in range of this transponder, the receiver of the unit in the train receives the signal condition wirelessly and updates the display unit D1 that is with the driver. The driver is then alerted using audible alarm of the signal received.

10

- Upon receiving the signal and hearing the audible alarm, the driver of the train is duty bound to acknowledge the signal received and correctly interpreted. The acknowledgement happens by the press of a button on D1. There may be different assortment of acknowledgement mechanisms to identify the correct signal interpretation. Upon pressing of the correct acknowledgement button, the system in the train sends back a signal to the station control about the driver acknowledging the signal.

15

- This makes the system independent of visually checking the signal at the signal post by the driver and also improves a feedback mechanism which eliminates any ambiguity at the part of the system or the driver.

20

- In addition, the control system TCU in the train, continuously checks for its GPS location. The TCU already has coordinates of locations where there are signals are to be expected for a given path. As soon as the train approaches the location of the signal, the system becomes aware of the likelihood of the signals and waits for it. In case the signal is not received within some known tolerances of distance, then the system alerts the driver that the signal might have been missed or malfunctioned.

25

- Similarly, if the system detects the presence of the signal at known location (from GPS) and if the driver is unable to (or did not) provide the acknowledgement then it raises the appropriate alarm immediately to the station control system through the same communication channel as that of the signal. There could be times when the driver might have not been able to press the acknowledgement button on time, in such case, the system keeps reminding the driver via an audio visual notification until such time as the driver has acknowledged it or the usefulness of the signal has well passed the location for which it was meant to be.
- 10 There are times when a train needs to moves out of its current track and changes its direction to a different track during the regular course of its travel. During such an event, every time the track merges or bifurcates, the train updates its trackID by strategically places track ID transponders.
- 15 Additionally, when on a particular track with a trackID, the TCU continuously broadcasts its trackID through a range of Tlr or a relevant distance as determined by the railway authority. Also during this period, it continuously listens for any relevant signals. In doing so, the train sends messages about its occupancy of a certain track which should never be occupied by any other train in the same distance and time. In case it receives the broadcasts of another train with the similar trackID, then it identifies that there is another train in the same line, thereby detecting that there is an eminent case of collision.
- 20 In such a scenario it starts to broadcast the emergency message for any trains in the vicinity as an alert to reduce speed immediately and cross check their trackID in order to avoid any collision.
- 25

Additionally the system can be made to apply the brakes of the trains such that it reduces the chances of the collision.

5 Additionally, as soon as the train moves through the track transponder, it can notify the station system about its arrival such that display systems can be put across relevant places for commuters and passengers to know about its arrival more accurately. In relevant situations, the system may also utilize the GPS to ascertain its location and send it to the station system to the same effect.

10 Even in another use of the system, the as soon as the train moves across the track transponder, it can display at relevant locations inside the train so that the passengers in the train can get to know of the relevant information on the upcoming stations and plan their de-boarding of the train.

15 The transponders in the systems were tested using RF modules created around RF IC from Nordic Semiconductors and Chipcon ICs. Both 2.4GHz as well as 915MHz band were utilized for the testing. In comes cases, power amplifier were used to enhance the range of the transponders as applicable.

20 For the TrackID transponders, they were constructed in a battery driven mode in a low power configuration mode, such that one set of lithium cell were age tested to last for more than 5 years.

25 It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above method and in the construction set forth without departing from the spirit and scope of the invention is intended that all matter

contained in the above description and shown in the accompanying drawings shall be interpreted as illustrated and not in a limiting sense.

5 It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention in which, as a matter of language might be said to fall there between.

CLAIMS

We claim:

1. An obstruction independent persistent signalling system comprises of:

- a. at least one Radio Frequency Transponder installed on the train;
- b. at least one control unit installed on the train to communicate the signals;
- c. two or more station transponders;
- d. one or more computer control server installed at station;
- e. two or more signal towers;
- f. one or more display units;
- g. one or more alarm units;
- h. one or more track ID transponders;
- i. one or more GPS tracking modules; and
- j. one or more 2G/3G/4G wireless, mobile messaging modules;

wherein,

the radio frequency transponders on the train transmit signals controlled by control unit installed on the train;

a system of said multiple station transponders receive signal from the transponders of arriving train and transmits the signal to the said station computer control server;

the station computer control server in turn transmits the required signal to signal towers automatically or through manual intervention; and

the station computer control server further transmits the required signal data to the display units and alarm units installed on the train as well as station automatically or through manual intervention.

2. The obstruction independent persistent signalling system as claimed in claim 1 wherein,

the said Radio Frequency Transponders installed on the train are in communication with the said control unit installed on the train;

the said transponders have unique identity number specific to each train; and

the said transponders are installed on front and rear dash boards; or top or side of the engine and guard cabin; or as per the requirements.

3. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the said control unit installed on the train is a multitude of hardware and software placed inside driver cabin and/or guard cabin;

the said control unit communicates using radio frequency signals using but not limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and Passive Radio Frequency Identification (RFID) etc.;

the said control unit provides for an acknowledgement input mechanisms in the form of, but not limited to, switches, touch screen, voice active commands etc.

4. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the said station transponders are installed on every track of a particular station; each of the said station transponders on each track have a unique track identity number; and the said station transponders are in communication with the said computer control server installed at station.

5. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the said track ID transponders are located on railway track; the said track ID transponders broadcast the track ID continuously at a predetermined interval for the train moving on top of it to capture the data.

6. The obstruction independent persistent signalling system as claimed in claim 1 wherein,

the said computer control server installed at station is a multitude of hardware and software placed inside driver cabin and/or guard cabin;

the said computer control server communicates using radio frequency signals using but not limited to, Assisted Global Positioning System (AGPS), baseband radio frequencies (RF), Global System for Mobile communication (GSM), General Packet Radio Service (GPRS), Short Messaging Service (SMS), and Active and Passive Radio Frequency Identification (RFID) etc.;

the said computer control server provides for a feedback signal input mechanisms in the form of, but not limited to, switches, touch screen, voice active commands etc.

7. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the signal towers located near station comprise radio frequency transponders having unique location Identity number and visible signalling means like signal lights, Light Emitting Diodes and other such devices known in the art; and

wherein, each of the said transponders on signal towers continuously broadcast data on a predetermined interval.

8. The obstruction independent persistent signalling system as claimed in claim 7 wherein, the said broadcast data includes, but not limited to, its identity, signal data i.e. go (green) or stop (red), data like which train this signal is for (as decided by the control computer at the station depending on the pre known schedules), recommended speed for the train moving past the station, stop durations if any, when did the last train left the same track and platform in the station and at what time so that the driver gets all this info on a screen before train reaches the station.

9. The obstruction independent persistent signalling system as claimed in claims 1, 5 and 7 wherein,

the signal towers located at station are in communication with computer control server installed at station;

the signal towers display feedback signal as red, green, or yellow as provided by the computer control server;

the signal towers further broadcast these signals till the time the train receives it and acknowledges it and sends the acknowledgement data back to station server; and

wherein the said communication cycle is independent of visibility factors and signals are viewed even in absolute zero visibility due to adverse climatic conditions like fog, rain, smog, haze, snow etc.

10. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the said display unit comprises visible signalling means like signal lights, Light Emitting Diodes and other such devices known in the art;

the said display unit is installed at station, and on front and rear dash boards of the engine and guard cabin; and

the display unit displays information regarding station and platform number which may further be transmitted to the passengers on board through visible or audible announcements.

11. The obstruction independent persistent signalling system as claimed in claim 1 wherein, the said alarm unit comprises audible messaging means;

the said alarm unit is installed at station, and on front and rear dash boards of the engine and guard cabin; and

the said alarm unit alarms the personnel about fault, tamper at any level; or missed acknowledgement of signals at any level; or missed feedback signal at station level; or in case of any catastrophe.

12. The obstruction independent persistent signalling system as claimed in claim 1 wherein the anti collision mechanism is initiated by the control unit installed on trains and an alert through display unit or alarm unit is activated whenever the transponders on the trains transmit/receive signals broadcasting same unique track ID from another train.

13. A method of obstruction independent persistent signalling comprising the steps of:
- a. track ID transponders on railway track broadcast track ID;
 - b. the broadcast data of step a is received by transponders on train;
 - c. the radio frequency transponders on the train broadcast data received in step b along with data including, but not limited to, unique ID number corresponding to the train, speed of the train etc.;
 - d. a system of multiple station transponders receive data of step c and broadcast the same;
 - e. the data of step d is sent to the said station computer control server;
 - f. the station computer control server in turn transmits, automatically or through manual intervention, the required data to signal towers i.e. go (green) or stop (red), data like which train this signal is for (as decided by the control computer at the station depending on the pre known schedules), recommended speed for the train moving past the station, stop durations if any, when did the last train left the same track and platform in the station and at what time;
 - g. the signal transponders receive and broadcast the data of step f;
 - h. the data broadcasted in step g is received by train transponders and the driver gets all this information on a screen before train reaches the station;
 - i. the received data in step h is acknowledged by input mechanisms present in train in the form of, but not limited to, switches, touch screen, voice active commands etc.;
 - j. the acknowledgement data in step i is broadcasted by train transponders which is then received by signal transponders;
 - k. the signal transponders broadcast the data received in step j which is then received by station transponders;
 - l. the station transponders broadcast the data received in step k which is transmitted to the station computer control server; and

wherein if no acknowledgement data is transmitted as in steps i-l above, the station computer control server transmits the required signal data to activate alarm units installed on the train as well as station automatically or through manual intervention.

14. The obstruction independent persistent signalling system as claimed in foregoing claims wherein all signals and actions taken are logged for any later requirement or assessment.

15. An obstruction independent persistent signalling system as substantially as described herein with reference to the drawings and the foregoing description.

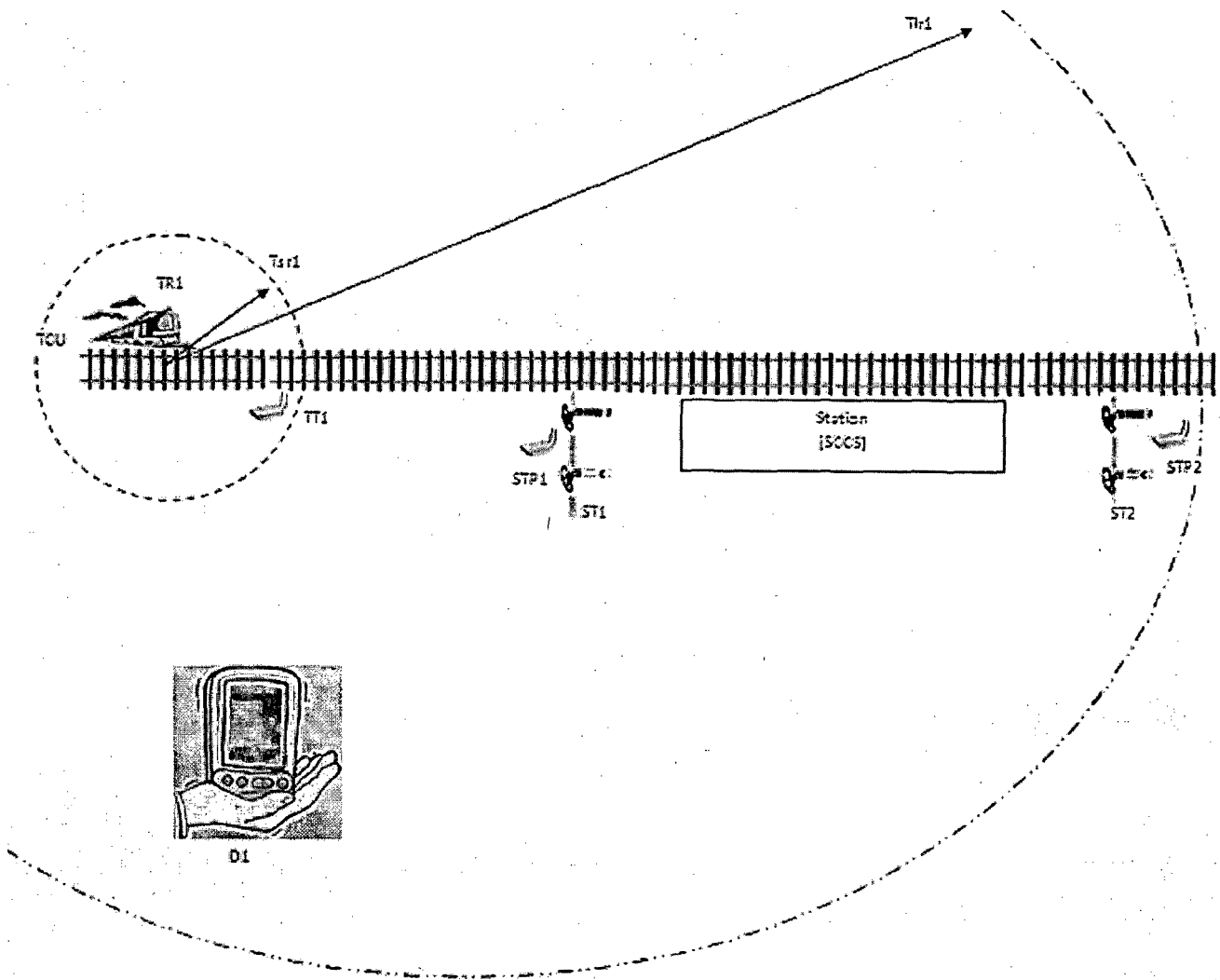


FIG.1

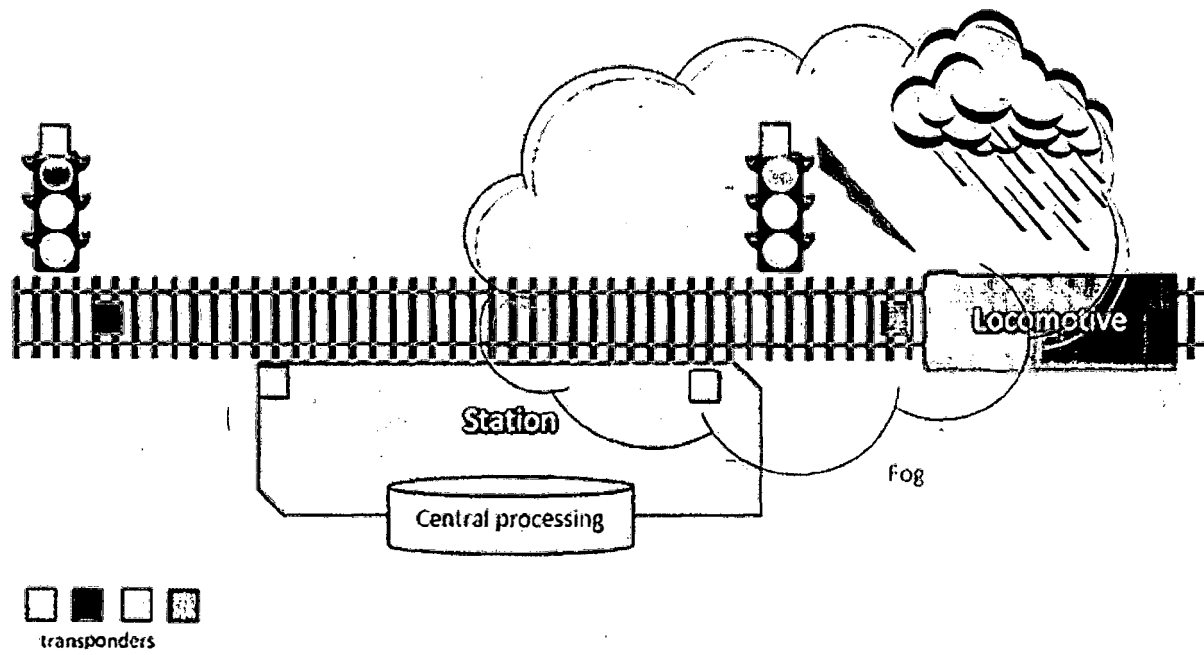


FIG.2

INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2011/000240

A. CLASSIFICATION OF SUBJECT MATTER

INV. B61L27/00 B61L15/00 B61L25/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	EP 1 752 355 A2 (WESTINGHOUSE BRAKE & SIGNAL [GB]) 14 February 2007 (2007-02-14)	1-11,13, 14
Y	paragraphs [0008] - [0032]; figure 1 -----	12
X	EP 1 674 371 A1 (DEUTSCH ZENTR LUFT & RAUMFAHRT [DE]) 28 June 2006 (2006-06-28)	1-11,13, 14
Y	paragraphs [0013] - [0037]; figures 1,2 -----	12
Y	US 4 864 306 A (WIITA FLOYD L [US]) 5 September 1989 (1989-09-05) column 2, line 14 - column 3, line 6 column 5, line 5 - column 9, line 62 figures 2-7 -----	12
A	EP 1 942 041 A2 (WESTINGHOUSE BRAKE & SIGNAL [GB]) 9 July 2008 (2008-07-09) paragraphs [0011] - [0018]; figures 1-5 ----- -/-	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2011/000240

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"Chapter 6: Radio Block Centre (Doc. No. 06E2365A)", ERTMS SYSTEM REQUIREMENTS SPECIFICATION, MANAGEMENT SYSTEM, BRUSSELS, no. version 5A, 31 July 1998 (1998-07-31), pages 6/1-6/23, XP007904575, the whole document -----	1-14

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IN2011/000240

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