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(54) **Telematics and communications arrangement**

(57) This invention relates to a system for providing a wireless data transfer in urban environment for a telematics system in traffic monitoring and control by using intersection control cabinets (EN) or traffic light posts

(TL) as installation sites. The data transfer connection for intersections comprises a wireless link connection between devices housed in the intersection control cabinets for routing a permanent connection covering the range of several intersections.

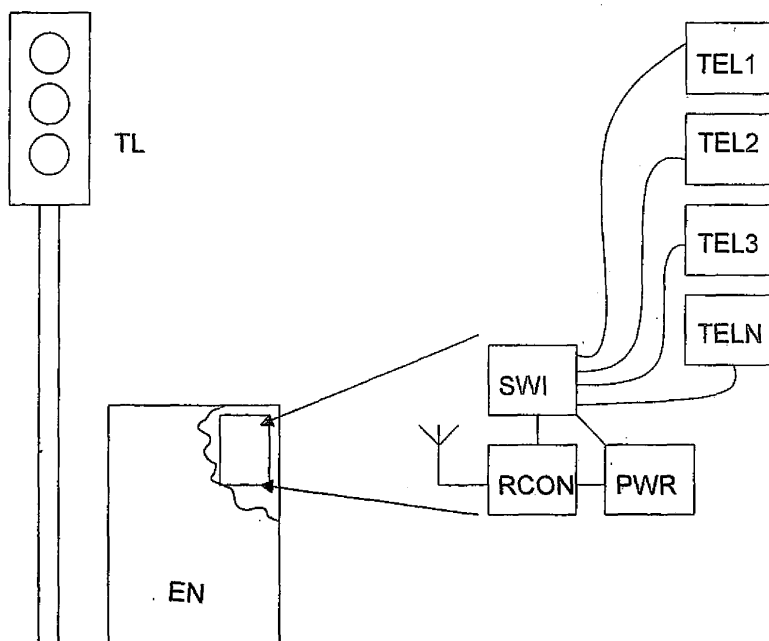


Fig 1

Description

[0001] The invention relates to providing data transfer in telematics systems used for traffic monitoring and control.

[0002] Several telematics solutions have been tested for example in controlling traffic lights in an effort to improve public traffic flow. Likewise, traffic cameras are used as an aid in traffic control. A problem is generally caused by the costs of a data transfer connection. Building a citywide control or camera system requires that each controlled unit or camera be provided with a telecommunication connection. The connection can be established in a wireless manner, for example as a wireless data service purchased from a teleoperator, for example as a 3G or Flash-OFDM service. However, the operating costs of mobile service contracts are high and the quality of connection fluctuates considerably according to a base station load.

[0003] A wide-range telematics system requires thousands of telecommunication connections, whereby, if a specific mobile data interface is used for every telematics device, the monthly operating costs rise to a considerably high level. In addition, for example the prioritization of traffic lights does not work properly if the transfer of data involves plenty of delays and the delays are highly irregular. In case of using a landline connection to each service point, the investment in cable-laying infrastructure will in turn be high, especially in urban environments where earth moving work for cable laying is remarkably expensive.

[0004] Furthermore, even with wireless data transfer devices, there is a problem of finding a reasonably priced installation space for providing a weather shelter and an anti-vandalism shelter, a power supply and cable systems for telematics hardware.

[0005] For the above reasons, it is expensive to build a wide-range telematics system in urban environment.

[0006] A telecommunication solution, built solely for telematics, is often in less-than-full service and thus a financial burden. The quality standards for a telecommunication connection in several telematics applications are high, regarding particularly the nature of delays, even if there is no need for much of a data transfer band.

[0007] An objective of the invention is to develop an economically more viable way of providing an urban environment compliant telecommunication solution for a telematics system with efficient use of resources.

[0008] According to the invention, the installation sites for telecommunications and telematics hardware are available in intersection control switch cabinets. These contain electronics even now and are supplied with electric power and some sort of data transfer connection. Furthermore, from intersection control cabinets extend cable systems and/or pipe systems to traffic light posts, which are in turn placed at corner locations of city blocks. Thus, the data transfer device housed in a traffic light control cabinet is in a favorable position for building a

wireless extension line across the city block. In addition, traffic light posts are conveniently located with respect to intersection-approaching vehicles, whereby data transfer between the vehicle and the intersection control system can be established with wireless and powerful directional antennas, resulting in a trouble-free and reliable telecommunication connection. In the vicinity of an intersection control cabinet can often be other tall structures, for example lamp posts and buildings, which can be used for placing the antenna.

[0009] The accompanying drawing 1 shows one telecommunication hardware assembly according to the invention.

[0010] Traffic-lights TL controlling electronics is installed in an intersection control cabinet EN, while an assembly of the invention is shown in an enlarged scale next to the cabinet. A wireless communication device RCON may function either as a circuit connected or packet connected link to other devices. A switch SW functions as a router and a data transfer monitor for devices TEL1..TELN; which may include for example a WLAN base station, a traffic lights control device, a traffic camera, a web camera, a weather station, etc. The wireless communication device establishes a link to neighboring intersections, the device being able to operate on free radio frequencies, for example on a 2.4GFz range, or being operable on permit-regulated frequencies. Another possibility is to use for example optical radiation, such as an infrared link, for data transfer as long as there is an unobstructed visual communication with the link connection. The actual transmitter device can also be housed in a traffic light post, whereby the traffic between itself and other electronics present in the cabinet EN can be established as non-radio frequency data transfer, another possibility being to make use of wires existing between traffic lights and the cabinet EN. For example, it is viable to use modulated data transfer in electric wires. There may be several devices RCON, for example one for each neighboring intersection, equipped with a directional antenna, thus improving the data transfer in terms of reliability and speed.

[0011] According to a further preferred embodiment, from the intersection control cabinet EN, housing a telecommunication connection, is established a wireless data transfer connection by using traffic light posts TL as an antenna mast for wireless connection. From the standpoint of radio route, this generally enables a good link connection to the next intersection and, since the traffic light posts are located at the corners of city blocks, a single telecommunication connection and a single link-to-link leg enable covering 4 subsequent intersection control cabinets and the telematics systems enclosed therein. In a grid-plan area, the system of two link-to-link legs covers 8 more intersection control cabinets. In other words, a single permanent telecommunication connection and a system of two link-to-link legs in a grid-plan area, in which every intersection allows a visual communication with the next intersection, will be able to cover

the data transfer of 13 intersections, as long as the maximum number of link-to-link legs is two and one link-to-link leg has a length of one city block. Thus, the wireless chain-linking of connection provides a considerable saving in teleoperator costs. Chain-linking can also provide redundancy, i.e. enables covering basic services, even if an individual telecommunication connection were out of service. In that case, the telecommunication connection is made up for by chain-linking a connection from one or more neighbors. Thus, the system is constructed in such a way that, if necessary, the chain-linking of data transfer connections becomes reorganized and makes up for missing connections. As a result, the standard of service probably suffers, but critical services can be upheld in operation.

[0012] Instead of radio links, the intersection-to-intersection link can also be established by using power network cabling for modulated data transfer over power cables. The use of power cables as a link connection is in many instances less expensive than the use of a radio link between intersections. It is also viable to use both at the same time, the connections serving as backup connections for each other. It is also viable to use the cables of street lamps.

[0013] It is also viable to use an existing cable system as a data transfer connection in place of or in addition to a wireless link, such that from one intersection control cabinet EN is established a connection, for example over power cables or street lamp cables, to base stations present in the cabinets or posts of another intersection. In this case, the base stations may only contain a modem device for data transfer proceeding over a power network or traffic light cables, and an actual wireless base station. It is viable to use power network connecting filters of the prior art for bridging a connection from one cable to another or, for example, for circumventing the power switches.

[0014] Because the price of data transfer capacity in a permanent data transfer connection is proportionally more favorable in high-capacity connection, it is more economical to set up just a few data transfer connections to serve a wide-range area than to provide a plurality of low-capacity connections. On the other hand, because it is not advisable, for reasons of reliability, to use just one data transfer connection for serving a very wide-range area, some data transfer band is left without use in the telematics system. This band can be preferably offered as a WiFi service to the public or it can be linked, for example, for the disposal of mass transit passengers to be used inside a transport vehicle. The telematics and control services are prioritized by means of routers and firewalls, such that the public service does not hamper the critical functions of a system. Traffic prioritizing routers and router software systems are prior known and represent available technology. It is viable, for example, to use solutions similar to those applied in VOIP-traffic supporting routers which know how to reserve a certain band for undelayed data transfer without limiting other traffic un-

necessarily. Hence, a network managed by the actual telematics operator can be safely distributed for a plurality of uses, as long as the routing and firewalls are designed in such a way that the real-time data is always given a priority or allocated a data transfer band required thereby.

[0015] The system according to the invention enables the position data of thousands of vehicles to be transmitted to a centralized traffic monitoring and control system. On the basis of this, it is possible to control traffic lights for improving the flow of mass transit traffic. On the basis of accurate position and congestion data, the customer service can also be provided in the way of route planning based on real-time time-tables and a real traffic condition.

[0016] This enables building, along with the telematics system, a wireless internet service providing extra value for mass transit customers, thereby improving the viability of a telematics system in terms of its telecommunication investment as the system's operating costs are distributed for an increased number of users. As opposed to a wireless data transfer service purchased from a teleoperator, the result is a system self-controlled in terms of its technical quality. A teleoperator is not able to guarantee a certain service standard at a reasonable price for example by means of wireless internet accesses.

[0017] In practice, for the system according to the invention, there is purchased or built a stationary wired or wireless connection for just some of the intersections, which connection is routed and distributed to neighboring intersections in a wireless manner or by using an existing cable system between intersections over a modulated wired link connection. A wireless link connection between intersections can also be implemented by using components which are common with a wireless connection to be designed in a vehicle. The wireless connection to vehicles can be for example a WLAN or permit-regulated connection.

[0018] The system can be for example a solution complementing a telecommunication connection specific for a mass transit vehicle, which is used for supplementing data transmission in the most congested areas, while using elsewhere for example a Flash-OFDM connection purchased from a teleoperator. The system according to the invention enables a higher-speed and delaywise more manageable connection for example from a bus to the traffic lights control center. The data transfer delays of GPRS, 3G or Flash-OFDM networks, for example, fluctuate according to a base station load to such an extent that the use thereof for the prioritization of traffic lights is not easy. A standalone wireless connection, managed by a teleoperator, can be optimized to become more constant in terms of delays by prioritizing time-critical traffic, for example position data used in the prioritization of traffic lights, to override other telecommunication. In case of a delay in position data, the bus, for example, may be compelled to stop at traffic lights unnecessarily prioritization notwithstanding or, after the bus has already passed an intersection, other may be compelled to wait unneces-

sarily. The time accuracy demand of optimal traffic light prioritization is in the order of clearly less than a second and, in order to enable prioritization to be conducted in a centralized and all-around optimized manner, it is well worth knowing in real time the locations of all mass transit vehicles presently in the vicinity of intersections.

[0019] On the other hand, the data transfer demand regarding an accurate image of traffic cameras is seldom totally in real time, i.e. the data flow thereof can be buffered or the data flow can be limited by data packing. As an example, for rush hour traffic control, there is no need to have a very high bitrate image in order to receive real-time information about the amounts and speeds of automobiles. In the event that camera images are desired for use as evidence for penalty charges or for the identification of vehicles for other reasons, a considerably more accurate image is required, but the transmission of that can be requested as less urgent. Thus, it is possible to use a real-time, low resolution and highly packed image for traffic control demands, and a more accurate image, transmitted later by request, for the identification of automobiles, or a more detailed recording can be transmitted automatically as soon as data transfer capacity becomes available.

Claims

1. A system for providing a wireless data transfer in urban environment for a telematics system in traffic monitoring and control by using intersection control cabinets (EN) or traffic light posts (TN) as installation sites, **characterized in that** the data transfer connection for intersections comprises a wireless link connection between devices housed in the intersection control cabinets for routing a permanent connection covering the range of several intersections.
2. A system as set forth in claim 1, **characterized in that** the systems of data transfer are adapted to route telecommunications over a link connection of one or between several intersections, such that, as one permanent connection develops a fault, the data transfer is conducted by using some other permanent connection or several connections.
3. A data transfer system as set forth in either of the preceding claims, **characterized in that** the wireless connection is used for data transfer between a vehicle and a telematics system.
4. A data transfer system as set forth in any of the preceding claims, **characterized in that** the wireless connection is adapted for use in the transmission of position data, used for traffic light prioritization, to a traffic control center.
5. A data transfer system as set forth in any of the preceding claims, **characterized in that** the wireless connection is adapted for use in the data transfer of traffic or onboard cameras.
6. A data transfer system as set forth in any of the preceding claims, **characterized in that** the wireless data transfer connection is adapted for distributed to the public, either directly or by being routed further inside a vehicle, for example by means of a Bluetooth or WLAN connection.
7. A data transfer system as set forth in any of the preceding claims, **characterized in that** the data transfer system is part of a mass transit telematics system.
8. A data transfer system as set forth in any of the preceding claims, **characterized in that** the data transfer system is adapted for use also in the demands of a public wireless internet service.
9. A data transfer system as set forth in any of the preceding claims, **characterized in that** a vehicle-serving base station or transmitter device is installed in a traffic light post and the data transfer between it and the intersection control cabinet (EN) is provided as a modulated data transfer by means of previously installed cables.
10. A data transfer system as set forth in any of the preceding claims, **characterized in that**, in addition to or instead of a wireless link connection between intersections, there is used between intersections a modulated data transfer in cables previously installed between intersections.

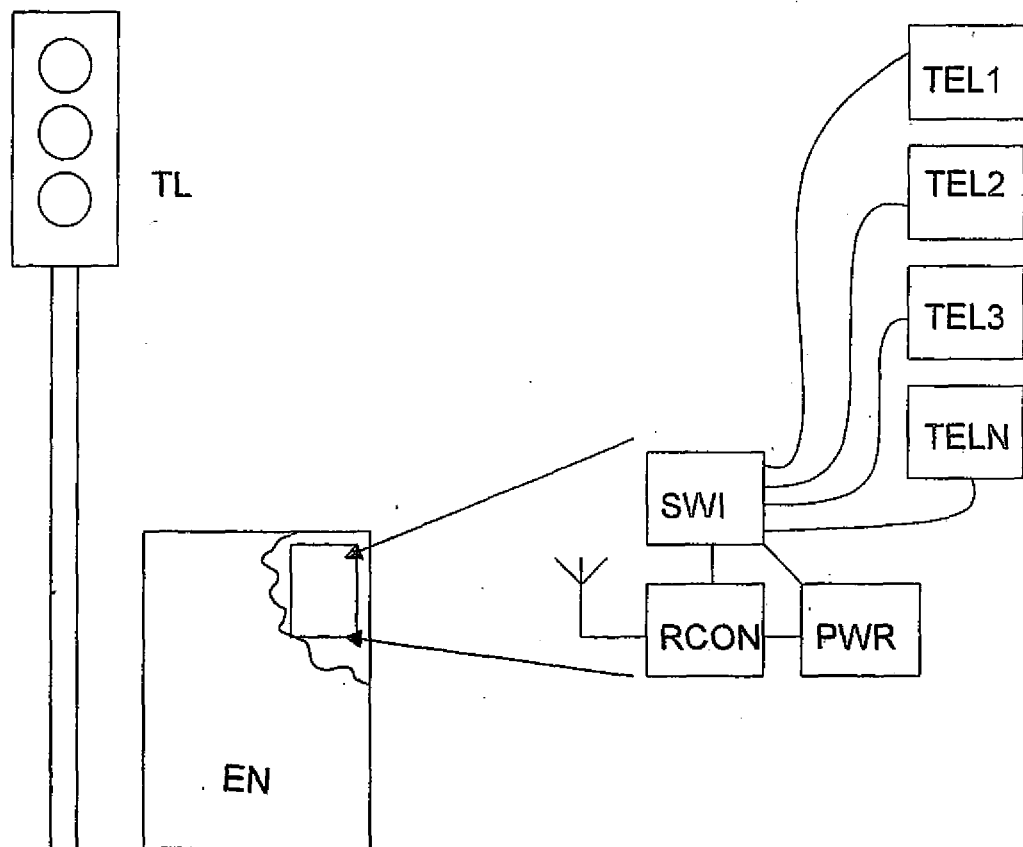


Fig 1



EUROPEAN SEARCH REPORT

Application Number
EP 08 39 7526

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 May 2009	Examiner Heß, Rüdiger
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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