

676282

P/00/008
Section 29(1)
Regulation 3.1(2)

AUSTRALIA
Patents Act 1990

NOTICE OF ENTITLEMENT

We MANNESMANN AG
of MANNESMANNUFER 2
D-4000 DUSSELDORF 1
GERMANY

being the applicant(s) and nominated person(s) in respect of an application for a patent for an invention entitled ~~ARRANGEMENT FOR A USE BILLING SYSTEM~~ CHARGING SYSTEM.
(Application No. 62814/94), state the following:

1. The nominated person(s) has/have, for the following reasons, gained entitlement from the actual inventor(s):

THE NOMINATED PERSON DERIVES ENTITLEMENT
TO ANY PATENT GRANTED IN RESPECT OF THE
INVENTION BY WAY OF EMPLOYMENT OF THE
ACTUAL INVENTOR

2. The nominated person(s) has/have, for the following reasons, gained entitlement from the applicant(s) listed in the declaration under Article 8 of the PCT:

THE NOMINATED PERSON IS THE BASIC
APPLICANT LISTED IN THE DECLARATION UNDER
ARTICLE 8 OF THE PCT

3. The basic application(s) listed in the declaration under Article 8 of the PCT is/are the first application(s) made in a Convention country in respect of the invention.

DATED: 9 December 1996

MANNESMANN AG

GRIFFITH HACK
MELBOURNE OFFICE



C. M. BENTLEY

Patent Attorney for and
on behalf of the applicant(s)





AU9462814

(12) PATENT ABRIDGMENT (11) Document No. AU-B-62814/94
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 676282

- (54) Title
CHARGING SYSTEM
- International Patent Classification(s)
(51)⁵ G07B 015/00 G01C 021/20 G01S 005/14
- (21) Application No. : 62814/94 (22) Application Date : 10.03.94
- (87) PCT Publication Number : WO94/22112
- (30) Priority Data
- (31) Number (32) Date (33) Country
4310099 23.03.93 DE GERMANY
- (43) Publication Date : 11.10.94
- (44) Publication Date of Accepted Application : 06.03.97
- (71) Applicant(s)
MANNESMANN AG
- (72) Inventor(s)
ANDREAS WIDL
- (74) Attorney or Agent
GRIFFITH HACK , GPO Box 1285K, MELBOURNE VIC 3001
- (56) Prior Art Documents
US 5307277
EP 508405
EP 425961
- (57) Claim

1. A charging system based on use with a device to identify sections of roads used by a moving object within a road system or in determined geographical areas into which the object enters, having the following components:

- a) a system for wireless transmission of information to recognise the actual geographic position of the object, which system is installed outside of the moving object and is independent from the road sections travelled and geographic areas determined;
- b) a receiving system carried by the moving object for the wireless transmitted information for the purpose of position recognition;
- c) a first storage device carried by the object for temporary storage of data of the actual geographic position of the object;
- d) a second storage device carried by the object for permanent storage of specified geographic positions (identification points) for equivocal characterisation of

(11) AU-B-62814/94
(10) 676282

-2-

individual sections of the road of the road system and/or determined geographic area;

e) a comparison device carried by the object for the comparison of the relevant geographic position of the object determined at regular intervals with the position data of the identification points;

f) an identification device carried by the object for the identification of the road section covered on each occasion by the object and/or of the determined geographic area entered into or exited from on the basis of the geographic positions determined by the comparison device which had been just passed by the object, which positions correspond to identification points;

g) a mobile storage module which by means of information technology can be connected with the identification device, in which module the actual section of the road covered and/or the presence in a determined geographic area identified at the time will be entered.



| | | |
|--|----|---|
| (51) Internationale Patentklassifikation ⁵ : G07B 15/00, G01C 21/20, G01S 5/14 | A1 | (11) Internationale Veröffentlichungsnummer: WO 94/22112 |
| | | (43) Internationales Veröffentlichungsdatum: 29. September 1994 (29.09.94) |

| | |
|---|--|
| (21) Internationales Aktenzeichen: PCT/DE94/00276 | (81) Bestimmungsstaaten: AU, BB, BG, BR, BY, CA, CN, CZ, FI, GE, HU, JP, KG, KP, KR, KZ, LK, LV, MD, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SI, SK, TJ, TT, UA, US, UZ, VN, europäisches Patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI Patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). |
| (22) Internationales Anmeldedatum: 10. März 1994 (10.03.94) | |
| (30) Prioritätsdaten: P 43 10 099.6 23. März 1993 (23.03.93) DE | |
| (71) Anmelder (für alle Bestimmungsstaaten ausser US): MAN- NESMANN AG [DE/DE]; Mannesmannufer 2, D-40213 Düsseldorf (DE). | Veröffentlicht Mit internationalem Recherchenbericht. |
| (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): WIDL, Andreas [DE/DE]; Lindenstrasse 26, D-82166 Gräfelfing-Lochham (DE). | |
| (74) Anwälte: MEISSNER, Peter, E. usw.; Hohenzollerndamm 89, D-14199 Berlin (DE). | |

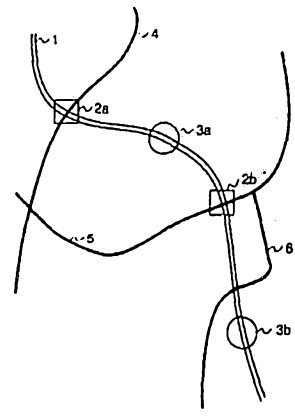
676282

(54) Title: ~~ARRANGEMENT FOR A USE BILLING SYSTEM~~ CHARGING. SYSTEM.

(54) Bezeichnung: EINRICHTUNG FÜR EIN NUTZUNGSABRECHNUNGSSYSTEM

(57) Abstract

The invention relates to an arrangement for identifying sections of road used by a moving object within a road section system, or of fixed geographical areas traversed by the object, for a use billing system. In order to provide a billing system usable as universally as possible which requires only little expenditure on basic facilities, it is proposed that there be an independently installed system for the non-cabled transmission of information for detecting the current geographical position of the object, that the moving object carry a receiving system for the non-cabled transmission of information and a storage device for the temporary storage of the data, that the object have a second storage device for the permanent storage of predetermined data, that the object also have a comparator device for comparing said data, that there be an identification device carried by the object for identifying the section of road used and that there be a mobile storage module connectable by information technology means to the identification device.



(57) Zusammenfassung

Die Erfindung betrifft eine Einrichtung zur Identifizierung von Wegstrecken, die von einem bewegten Objekt innerhalb eines Wegstreckennetzes zurückgelegt werden, oder von festgelegten geographischen Zonen, die vom Objekt betreten werden, für ein Nutzungsabrechnungssystem. Um eine möglichst universell einsetzbare Abrechnungseinrichtung zu schaffen, die wenig infrastrukturellen Aufwand erfordert, wird vorgeschlagen, daß ein unabhängig installiertes System zur drahtlosen Übermittlung von Informationen zur Erkennung der aktuellen geographischen Position des Objektes vorgesehen ist, daß das bewegte Objekt ein Empfangssystem für die drahtlos übermittelten Informationen sowie eine Speichereinrichtung zur temporären Speicherung von Daten mitführt, daß im Objekt eine zweite Speichereinrichtung zur permanenten Speicherung vorgegebener Daten vorgesehen ist, daß das Objekt ferner eine Vergleichseinrichtung zum Vergleich dieser Daten mitführt, daß eine vom Objekt mitgeführte Identifikationseinrichtung zur Identifizierung der jeweils zurückgelegten Wegstrecke vorgesehen ist und daß ein mobiles, mit der Identifikationseinrichtung informationstechnisch verbindbares Speichermodul vorgesehen ist.



CHARGING SYSTEM.
~~Arrangement for a charging system based on use~~

5 The invention concerns an arrangement to identify sections of roads used by a moving object (e.g. car, motorcycle, truck, bus, ship, train, aircraft, person, parcel) within a road system (e.g. motorway system, waterway system, railway system) or in geographic areas (e.g. inner city, airspace, nature parks) into which the object enters for the purpose of a charging system based on use.

10 Usually border-guard-like charging posts are used to charge fees for the use of bridges or tunnels, at which the respective fee is collected by persons or automatic coin machines. In France and Italy a system is used for the charging of fees on sections of motorways whereby a ticket is taken by the driver of the vehicle at the place of entry to the motorway and at the
15 place of transit from a fee-free section to a fee-charging section of the motorway, on which the place of entry is noted in a machine-readable manner. The total distance covered can be determined on the basis of this ticket, the relevant usage fee calculated and collected at the place of exit or at the place
20 of transit from a fee-charging motorway section to a fee-free section. Although this system permits a reliable charging, its use presumes not only considerable investments to provide the



required infrastructure, particularly for the erection of charging stations with automatic ticketing machines, barricades and lights etc., but requires considerable personnel for the day and night operation of the charging stations also. Added to this is the great disadvantage, that due to the charging activity the traffic flow will be strongly impaired especially at times of peak traffic.

To avoid these expenses, for many years in Switzerland another system of collecting the charges for the use of the motorway has been used, which operates on the basis of a flat-rate payment for a fixed period of time. By paying a flat fee, the driver of the vehicle receives a label which is displayed in a visible manner on the vehicle and thus the entitlement to drive on the motorway is documented in a recognisable and controllable manner. This system does not require appreciable expenses on the infrastructure, as one can rely on existing arrangements (e.g. post offices, state border crossings) for the sale of the labels and for their checking (e.g. state border crossings on motorways, police patrols). But according to this a charging which corresponds to the actual extent of usage is not possible, so that when attributing costs the user-pays principle will be only inadequately taken into account.

Other systems have also been proposed, which allow an individual charging according to the actual extent of usage. However, they presume the provision of a suitable local infrastructure, as they are based, for example, on infrared systems or so called HF or RF transponder systems, i.e. on special mechanical devices to recognise and identify individual vehicles on the respective fee-charging road sections or correspondingly established geographical areas like, for instance, the inner city area, where the car traffic should be reduced. The transponder technology has been known for years from the field of military air traffic, where it is to enable to distinguish enemy flying objects from friendly ones. The principle of this is that an object to be identified is "buzzed" (e.g. by radar) by a control station (e.g. a ground

station, a ship or an aircraft) and it then sends automatically a correct recognition signal to the respective control station. When transposing this, for example, to a motorway fee charging system, it will mean
5 that at certain points (particularly at entries and exits) appropriate mechanical check stations have to be provided along the fee-charging section of the motorway to enable an uninterrupted detection of the data necessary for charging based on usage. Thus such a system requires a considerable
10 expenses for the installation of a surface covering special infrastructure.

The object of the invention is to propose an arrangement of the type described in the introduction, which is suitable not only for the charging of fees on motorways but also for
15 the detection of other uses of certain areas (road stretches, areas, spaces) by moving objects and requires relatively smaller expenses for the infrastructure.

According to the present invention there is provided a charging system based on use with a device to identify
20 sections of roads used by a moving object within a road system or in determined geographical areas into which the object enters, having the following components:

- a) a system for wireless transmission of information to recognise the actual geographic position of the object, which system is installed outside of the moving object and is independent from the road sections travelled and geographic areas determined;
- 25 b) a receiving system carried by the moving object for the wireless transmitted information for the purpose of position recognition;
- 30 c) a first storage device carried by the object for temporary storage of data of the actual geographic position of the object;
- d) a second storage device carried by the object for



permanent storage of specified geographic positions (identification points) for unequivocal characterisation of individual sections of the road of the road system and/or determined geographic area;

5 e) a comparison device carried by the object for the comparison of the relevant geographic position of the object determined at regular intervals with the position data of the identification points;

10 f) an identification device carried by the object for the identification of the road section covered on each occasion by the object and/or of the determined geographic area entered into or exited from on the basis of the geographic positions determined by the comparison device which had been just passed by the object, which positions
15 correspond to identification points;

g) a mobile storage module which by means of information technology can be connected with the identification device, in which module the actual section of the road covered and/or the presence in a determined
20 geographic area identified at the time will be entered.

It is preferred that the system use a radio-direction finding system for wireless transmission of information about geographic positions.

A preferred embodiment of the present invention is
25 described in detail below with the example of a motorway fee charging system based on use. The only figure shows a section of a road system with a motorway.

The system according to the preferred embodiment is made up of three main function blocks, namely:

- 30
- a vehicle-internal position detecting system,
 - a vehicle-internal charging system and
 - a mobile storage medium as charging data carrier.



The position detecting system comprises a system to receive information for the purpose of recognising the actual geographical position of the vehicle and a first storage device for the temporary storage of the actual position.

5 The information for the position recognition is received in a wireless manner from a system which is installed independently from the motorway system. This system is already present in any case in many ways or can be set up at a relatively small expense to suit the task of

10 transmitting corresponding information. Examples of this are the existing satellite navigational systems (e.g. GPS, Glonass) or radio-direction finding systems based on existing radio-telephone systems (e.g. C-, D-, E-networks), wherein based on various signal delay times to the

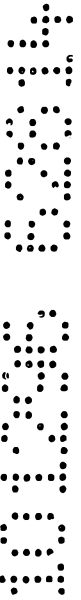
15 neighbouring ground stations a very accurate position determination can be carried out. Results may be transmitted to the vehicle as position data. A device is provided for the regular emission of identification data and for receiving position data. In case of satellite

20 navigation systems for the purpose of increasing the accuracy of the position determination it would be advisable to provide a reception facility for a correction signal (e.g. for the differential GPS system). Error influences like, for instance, satellite orbit error, clock

25 error and signal spread error will be compensated by this and a position definition under 10m is feasible. Such a correction signal and a position definition could be transmitted, for example, via radio (e.g. RDS) or via a GSM radio-telephone network. Systems which determine the

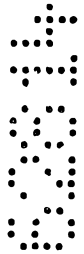
30 position of the vehicle from radio contact and the sensor system installed in the vehicle are also feasible. For example, a sensor to determine the distance travelled (e.g. by the revolutions of the rear wheels) and a magnetic field detector may be provided, which enable an accurate

35 determination of the position based on a digitalised road network if on each occasion before the commencement of the



drive the position of the vehicle is obtained via a communication device integrated in the vehicle. To enable a continuous maintenance of the position data in case of a temporary breakdown of the position determination system
5 (e.g. due to the shielding effect or unfavourable satellite position), a "dead-reckoning sensor" (e.g. in the form of a magnetic field detector) may be provided which is carried in the vehicle.

The charging system installed in the vehicle comprises
10 first of all a second storage device for the permanent storage of



specified geographic positions (identification points), which allow an unequivocal characterising of individual sections of roads of the road network and/or determined areas. Furthermore, there is a computer unit, which operates as a comparison device and compares constantly at short intervals (e.g. once or twice in each second) the actual position of the vehicle with the stored position data (coordinates) of the identification points. If the result is a sufficiently accurate agreement of the position data, the computer unit identifies the motorway section associated with this identification point, on which the travel takes place at the time. This will be explained in detail below.

The use of identified motorway sections is entered by the computer device into a mobile storage medium. Under such a mobile storage medium a device is understood which can be carried with the driver of the vehicle and when its use is required it can be connected by means of information technology with the computer unit via a read/write device. This mobile storage medium is preferably constructed as a magnetic tape or chip storage card. Other media, however, are also conceivable, for example programable storage components, like PAL-, FPLA- or FPLS components.

In case that the information received externally by the position determination system is not yet position data in the narrow sense of the word, the computer device takes over the additional task to calculate the coordinates of the vehicle's position at the time from this information. The second storage device with the position data of the identification points can be physically integrated in the first storage unit. It can be advantageous, however, to integrate the second storage device in the mobile storage module.

The principle of charging based on use can be explained based on the section of the road system illustrated in the figure, wherein besides a fee-charging motorway 1 fee-free roads 4, 5, 6 are shown which cross the motorway. The entries/exits 2a and

2b of the motorway are indicated with squares. The geographical positions of these indicated places are stored as identification points in the second storage unit. If now an actual position of the vehicle is recognised by the computer unit, which position coincides with the position of the square 2a or 2b (within a given accuracy), then this may mean that the vehicle is situated on a fee-charging section of the motorway. The case, however, could be that one deals here only with a crossing of the motorway 1 on the fee-free road 4 or 5. A subsequent passing through of the second square does not permit an equivocal statement in this regard either. One can, for example, reach square 2b from square 2a via the roads 4 and 5, i.e. just like via the motorway 1. Therefore, for this reason provision is made that between two directly neighbouring entries/exits of the motorway 1 in each case at least one additional identification point 3a, 3b (marked by a circle) is specified and stored on the motorway. This further identification point makes it possible that when it is passed after an identified entry/exit position, a fully equivocal statement can be made as to which section of the motorway is being used, so that a corresponding entry for the purpose of charging can be carried out on the mobile storage medium. To fully characterise the motorway system with all sections, motorway crossings and motorway overpasses are also determined with their position coordinates as identification points.

In principle it would be possible to carry out the effective fees based on use, say, monthly based on the recorded uses at the fee payment offices. It is, however, considerably more advantageous to treat the mobile storage unit in a manner similar to a telephone charge-card. This means that such a "motorway fee card" is bought by the user and by this he acquires the right to use the motorway within a determined extent (user credit). In case of the actual use of the motorway the successive fee for each section travelled on will be debited from the actual user credit.

If, in addition to the identification points of the motorway system the usage fees are also stored in the mobile storage medium, then it has the great advantage that in this case graduated rights for the use can be realised in a simple manner. It is feasible, for example, to issue special motorway fee cards for the use of certain regions or for certain sections (e.g. transit motorways). If different fees are applied to different types of vehicles (car, motorcycle, bus, truck), this too can be taken care of without any problem by arranging motorway fee cards with correspondingly different and other charges.

The vehicle-internal components of the device according to the invention, which are preferably constructed as a compact mobile charging equipment, may also be integrated, for example, physically in a car radio, in a terminal of a traffic guidance system or in a mobile radio set and accordingly firmly mounted in the vehicle. Mobile equipment are particularly suitable for the debiting of the fees from foreign vehicles, which do not have corresponding devices. Thus at the border crossings, in addition to the motorway use cards, charging equipment could be also loaned by paying a corresponding amount. The function of the charging equipment is activated preferably by that the motorway use card is introduced into a corresponding read/write device. When the vehicle is stationary, it could be provided that the equipment will shut off automatically to be activated again automatically on the recommencement of the travel. Vehicle-internal recording devices which make the driver aware of entering into a fee-charging zone and, in addition, to give clear instructions in time (similarly to a petrol gauge) about the imminent exhaustion of the user's credit are of advantage. A continuous indication of the actual user's credit is advisable. In a preferred manner stations are provided along the motorway (e.g. rest areas, petrol stations, car parks), where a filling up of the user's credit can take place by paying a certain amount or by purchasing a new motorway charge card.



There may also be provided a further indication means which can be activated by the identification device upon entry to a region subject to a fee based on use, and which signals a corresponding indication of the vehicle.

1
2
3
4

5
6
7
8



If necessary, the device according to the invention allows a strongly differentiated charging based on the use, wherein the intensity of the use (e.g. recording of the duration of stay in a fee-charging zone) can also be considered. For this purpose special input possibilities may be provided for the respective parameter. A sensible version would be, for example, to use lower rates for individual sections or the entire motorway in low-traffic times (e.g. depending on the season or at nights) to achieve a relief for the heavily used times by corresponding shifting of the traffic.

To prevent an unauthorised use of fee-charging sections or areas and, correspondingly, to enable a prosecution of a misuse of same, an outward acting signalling device (e.g. HF transmitter, RF transmitter, laser diode for infrared signal, etc.) is advisable, which in case of orderly fee-charging process and consequent rightful use of the road emits an "in order" signal. Accordingly, externally positioned receiving stations (e.g. installed in control vehicles used at the motorway exits) can detect those vehicles which do not carry the fee-recording system or do not operate the system installed in them in an orderly manner, i.e. do not pay the fee due. Alternatively or complementing this an outward acting signal device (e.g. a coloured control light) may be used, which is automatically activated if the travel is continued within the fee-charging area after having used up the user's credit. In such cases it could be also conceived to transmit a radio signal which enables an identification of the vehicle to a check-point. In these cases for the purpose of local traffic control the extent of the unauthorised further use of the motorway can be recorded on the mobile storage module.

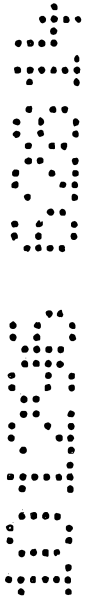
An important advantage of the solution according to the invention is that it does not require at all or at least not a great deal of new equipment for the infrastructure, but makes it feasible to use devices already available, i.e. which have been installed independently from the field of charging based on use. A further important advantage is that the determination

and the debiting of the fee takes place independently in the vehicle itself and accordingly there are favourable conditions with regard the data protection which eliminate an undesirable monitoring of the driving behaviour. Provision is made that no information remains stored which would enable an identification of the total section travelled by the respective vehicle within the fee-charging area. The intermediately stored information regarding the sections travelled are deleted after the charge for the use has been debited from the user's credit. The coordinates of the identification point passed last by the vehicle will be stored again in the storage, which will represent the start of the section actually driven over. However, if it is specifically requested, special debiting equipment could be made available which carry out a continuous recording of all section travelled over to enable, for example, transport companies to carry out automatic log-book entries.

As it has been outlined in the introduction, the use of the device according to the invention is by no means limited to road traffic, but can be transferred to a plurality of other applications.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A charging system based on use with a device to identify sections of roads used by a moving object within a road system or in determined geographical areas into which the object enters, having the following components:
- 5
- a) a system for wireless transmission of information to recognise the actual geographic position of the object, which system is installed outside of the moving object and is independent from the road sections travelled and geographic areas determined;
- 10
- b) a receiving system carried by the moving object for the wireless transmitted information for the purpose of position recognition;
- c) a first storage device carried by the object for temporary storage of data of the actual geographic position of the object;
- 15
- d) a second storage device carried by the object for permanent storage of specified geographic positions (identification points) for equivocal characterisation of individual sections of the road of the road system and/or determined geographic area;
- 20
- e) a comparison device carried by the object for the comparison of the relevant geographic position of the object determined at regular intervals with the position data of the identification points;
- 25
- f) an identification device carried by the object for the identification of the road section covered on each occasion by the object and/or of the determined geographic area entered into or exited from on the basis of the geographic positions determined by the comparison device which had been just passed by the object, which positions correspond to identification points;
- 30
- g) a mobile storage module which by means of information technology can be connected with the identification device, in which module the actual section of the road covered and/or the presence in a determined
- 35



geographic area identified at the time will be entered.

2. A device according to claim 1, characterised in that a computer unit is carried by the object, said computer unit calculates the geographic position of the object from the information transmitted in a wireless manner if the information transmitted in a wireless manner itself does not contain any position data.

3. A device according to any one of the claims 1 to 2, characterised in that the system for the wireless transmission of information about geographic positions is a satellite navigational system.

4. A device according to claim 3, characterised in that the receiving system carried along for the receiving of correction signals is installed for the purpose of improving the accuracy of the position recognition.

5. A device according to one of the claims 3 or 4, characterised in that a dead-reckoning sensor, particularly in the form of a magnetic field detector, makes a continuous recording of the position data in case of a temporary breakdown of the navigation system.

6. A device according to claim 1, characterised in that the system for the wireless transmission of information via geographic positions is integrated in a cellular radio-telephone network, wherein the receiving system in the object is a radio-telephone and the determination of the position is carried out on the basis of different signal delay times from the object to the individual receiving stations and the results are transmitted to the object as position data and wherein the radio-telephone is provided with a device for regular emission of its identification data and for receiving

5
15
20
25
30



position data also outside of the actual telephone usage.

7. A device according to one of the claims 1 to 2, characterised in that the system is a radio-direction finding system for wireless transmission of information
5 about geographic positions.

8. A device according to any one of the claims 1 to 7, characterised in that the mobile storage module is a magnetic tape or chip storage card.

9. A device according to any one of the claims 1 to
10 8, characterised in that the second storage device with the position data of the identification points is a component of the mobile storage module.

10. A device according to any one of the claims 1 to
15 9, wherein the moving object is a road vehicle and the road system is a motorway system, characterised in that the permanently stored data of the identification points refer to connecting points (entry and exit) of the motorway and at any time refer to at least one intermediate point of the motorway section situated between two immediately following
20 connecting points between these two connecting points.

11. A device according to any one of the claims 1 to 10, characterised in that the receiving system, the first storage device, the comparison device and the identifying device are combined into one charging equipment.

25 12. A device according to claim 11, characterised in that the charging equipment can be activated to operate by connecting the mobile storage module.

13. A device according to claim 11 or 12, characterised in that the charging equipment is a component



of a car radio or a terminal of a traffic guidance system mounted inside of the vehicle.

14. A device according to any one of the claims 11 to 13, characterised in that the charging equipment has a mobile construction.

15. A device according to any one of the claims 1 to 14, characterised in that debiting of an identified road section actually covered in a fee-charging road system and/or the entering into a determined geographic area can be carried out in each case in the form of a debiting from a credit amount (user's credit) stored in the mobile storage module, wherein the debited amount can be determined based on fee information over the road system, which is stored permanently either in the second storage device or in the mobile storage module.

16. A device according to claim 15, characterised in that at selected places, preferably at rest areas and petrol stations, stations are provided to fill up the stored amount of credit.

17. A device according to one of the claims 15 to 16, characterised in that a first display device is provided which emits a signal in the object signalling the imminent exhaustion of the amount of credit.

18. A device according to any one of the claims 11 to 17, characterised in that the charging equipment has facilities to enter parameters, which indicate the time and/or the intensity of the use of the road system by the object.

19. A device according to any one of the claims 1 to 18, characterised in that a second display device is



provided in the object, which upon entry in one of the road sections or geographic areas subject to a fee based on use can be activated by the identification device and signals a corresponding indication in the object.

5 20. A device according to any one of the claims 15 to 19, characterised in that an outward acting signalling device is carried by the object, which device in case of further stay on a road section or in a correspondingly determined geographic area subject to a fee based on use is
10 activated after using up the amount of credit.

15 21. A device according to any one of the claims 15 to 19, characterised in that an outward acting signalling device is carried by the object, which device emits an "in order" signal so long as an orderly debiting of the fee based on use is carried out.

22. A device according to claim 20 to 21, characterised in that the outward acting signalling device emits an optical signal, particularly an infrared signal.

20 23. A device according to claim 20 to 21, characterised in that the outward acting signalling device emits a radio signal.

24. A changing system based on use substantially as herein described with a reference to the accompanying drawing.

25 DATED THIS 9TH DAY OF DECEMBER 1996

MANNESMANN AG

By Its Patent Attorneys:

GRIFFITH HACK

30 Fellows Institute of Patent Attorneys of Australia



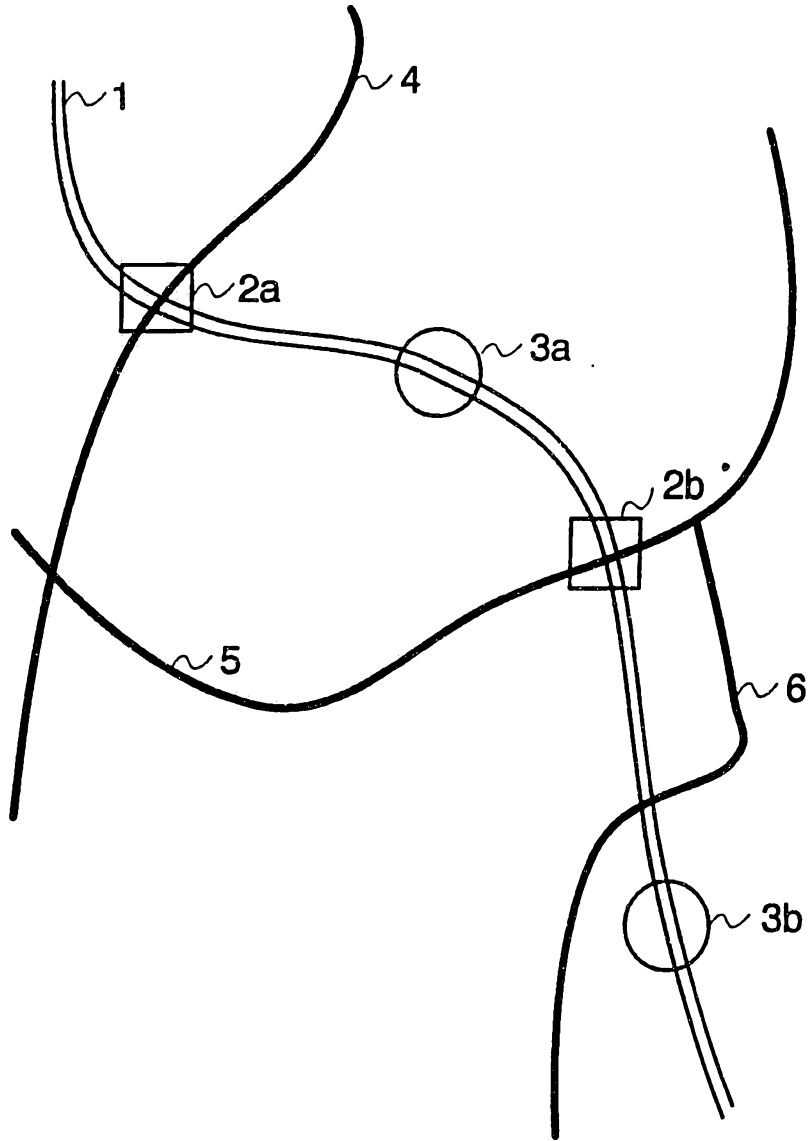
Abstract

The invention concerns an arrangement to identify sections of roads used by a moving object within a road system or in
5 determined geographic areas into which the object enters for the purpose of a charging system based on use.

In order to provide a universally usable fee charging device which requires little expense on the infrastructure, it is
10 proposed that to recognise the actual geographic position of the object an independently installed system for the wireless transmission of information is provided, that the moving object carries a receiving system for the information transmitted in a
15 wireless manner as well as a storage device for the temporary storage of data, that in the object a second storage device for the permanent storage of the specified data is provided, that furthermore the object carries a comparison device to compare these data, that an identification device to identify the road
20 section travelled over is provided which is carried by the object and that a mobile storage module is provided which can be connected with the identification device by means of information technology.

62814/94

1 / 1



INTERNATIONAL SEARCH REPORT

International Application No
PCT/DE 94/00276

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 G07B15/00 G01C21/20 G01S5/14

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)
IPC 5 G07B G07C G08G G01C G01S

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | EP,A,0 519 630 (SUMITOMO ELECTRIC INDUSTRIES) 23 December 1992 see column 5, line 14 - column 9, line 16; figures --- | 1-5, 9, 10 |
| A | EP,A,0 508 405 (SHARP) 14 October 1992 see column 1, line 55 - column 3, line 29 see column 6, line 44 - column 7, line 43; figures --- | 1, 3, 8, 9 |
| A | DE,A,35 37 730 (WÄCHTLER) 30 April 1987 see abstract; claims --- -/-- | 1, 2, 6, 7 |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *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
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * documents member of the same patent family

Date of the actual completion of the international search

10 June 1994

Date of mailing of the international search report

04. 07. 94

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+ 31-70) 340-3016

Authorized officer

Meyl, D

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/DE 94/00276

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | VEHICLE NAVIGATION & INFORMATION SYSTEMS CONFERENCE PROCEEDINGS, 1 October 1991, WARRENDALE, USA pages 977 - 987, XP000357202 KOMANECKY 'IVHS applications of smart cards' see page 980, column 2, line 10 - page 983, column 1, line 12; figures ---- | 1,8-16 |
| A | EP,A,0 425 961 (AUTOSTRADA CONCESSIONI E COSTRUZIONI AUTOSTRADA) 8 May 1991 see column 2, line 31 - column 10, line 29; figures ---- | 1,8, 10-16 |
| A | GB,A,2 243 957 (ESSAMS) 22 April 1992 see abstract; claims ---- | 1,8, 15-18 |
| A | IEEE PLANS '92 POSITION LOCATION AND NAVIGATION SYMPOSIUM, 1 January 1992 pages 528 - 533, XP000344347 KIRSON 'ATIS - a modular approach' see page 528, column 2, line 16 - page 531, column 2, line 4; figures ---- | 1-3,5 |
| A | DE,A,39 08 702 (PIONEER) 28 December 1989 see abstract; claims; figures ---- | 1,8,9 |
| A | VEHICLE ELECTRONICS IN THE 90'S: PROCEEDINGS OF THE INTERNATIONAL CONGRESS ON TRANSPORTATION ELECTRONICS, October 1990, WARRENDALE, USA pages 209 - 215 SUCHOWERSKYJ 'vehicle navigation and information systems in Europe - an overview' ----- | |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/DE 94/00276

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| EP-A-0519630 | 23-12-92 | JP-A- 4369424 | 22-12-92 |
| | | US-A- 5307277 | 26-04-94 |
| EP-A-0508405 | 14-10-92 | JP-A- 4315077 | 06-11-92 |
| | | JP-A- 4315078 | 06-11-92 |
| DE-A-3537730 | 30-04-87 | NONE | |
| EP-A-0425961 | 08-05-91 | CA-A- 2028459 | 26-04-91 |
| GB-A-2248957 | 22-04-92 | NONE | |
| EP-A-3908702 | 28-12-89 | JP-A- 2008712 | 12-01-90 |
| | | US-A- 4982332 | 01-01-91 |

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen
PCT/DE 94/00276

A. KLASSIFIZIERUNG DES ANMELDUNGSGEGENSTANDES
IPK 5 G07B15/00 G01C21/20 G01S5/14

Nach der Internationalen Patentklassifikation (IPK) oder nach der nationalen Klassifikation und der IPK

B. RECHERCHIERTE GEBIETE

Recherchiertes Mindestprüfstoff (Klassifikationssystem und Klassifikationssymbole)
IPK 5 G07B G07C G08G G01C G01S

Recherchierte aber nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Gebiete fallen

Während der internationalen Recherche konsultierte elektronische Datenbank (Name der Datenbank und evtl. verwendete Suchbegriffe)

C. ALS WESENTLICH ANGESEHENE UNTERLAGEN

| Kategorie* | Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile | Betr. Anspruch Nr. |
|------------|---|--------------------|
| A | EP,A,0 519 630 (SUMITOMO ELECTRIC INDUSTRIES) 23. Dezember 1992 siehe Spalte 5, Zeile 14 - Spalte 9, Zeile 16; Abbildungen --- | 1-5, 9, 10 |
| A | EP,A,0 508 405 (SHARP) 14. Oktober 1992 siehe Spalte 1, Zeile 55 - Spalte 3, Zeile 29 siehe Spalte 6, Zeile 44 - Spalte 7, Zeile 43; Abbildungen --- | 1, 3, 8, 9 |
| A | DE,A,35 37 730 (WÄCHTLER) 30. April 1987 siehe Zusammenfassung; Ansprüche --- | 1, 2, 6, 7 |
| | -/-- | |

Weitere Veröffentlichungen sind der Fortsetzung von Feld C zu entnehmen

Siehe Anhang Patentfamilie

- * Besondere Kategorien von angegebenen Veröffentlichungen :
- *A* Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist
- *E* älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist
- *L* Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgeführt)
- *O* Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht
- *P* Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist
- *T* Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist
- *X* Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann allein aufgrund dieser Veröffentlichung nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden
- *Y* Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren anderen Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann nabeliegend ist
- *Z* Veröffentlichung, die Mitglied derselben Patentfamilie ist

Datum des Abschlusses der internationalen Recherche

Absenddatum des internationalen Recherchenberichts

10. Juni 1994

04. 07. 94

Name und Postanschrift der Internationale Recherchenbehörde
Europäisches Patentamt, P.B. 5818 Patentaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Bevollmächtigter Bediensteter

Meyl, D

C.(Fortsetzung) ALS WESENTLICH ANGESEHENE UNTERLAGEN

| Kategorie* | Bezeichnung der Veröffentlichung, soweit erforderlich unter Angabe der in Betracht kommenden Teile | Betr. Anspruch Nr. |
|------------|---|--------------------|
| A | VEHICLE NAVIGATION & INFORMATION SYSTEMS CONFERENCE PROCEEDINGS, 1. Oktober 1991, WARRENDALE, USA Seiten 977 - 987, XP000357202 KOMANECKY 'IVHS applications of smart cards' siehe Seite 980, Spalte 2, Zeile 10 - Seite 983, Spalte 1, Zeile 12; Abbildungen --- | 1,8-16 |
| A | EP,A,0 425 961 (AUTOSTRADE CONCESSIONI E COSTRUZIONI AUTOSTRADE) 8. Mai 1991 siehe Spalte 2, Zeile 31 - Spalte 10, Zeile 29; Abbildungen --- | 1,8, 10-16 |
| A | GB,A,2 248 957 (ESSAMS) 22. April 1992 siehe Zusammenfassung; Ansprüche --- | 1,8, 15-18 |
| A | IEEE PLANS '92 POSITION LOCATION AND NAVIGATION SYMPOSIUM, 1. Januar 1992 Seiten 528 - 533, XP000344347 KIRSON 'ATIS - a modular approach' siehe Seite 528, Spalte 2, Zeile 16 - Seite 531, Spalte 2, Zeile 4; Abbildungen --- | 1-3,5 |
| A | DE,A,39 08 02 (PIONEER) 28. Dezember 1989 siehe Zusammenfassung; Ansprüche; Abbildungen --- | 1,8,9 |
| A | VEHICLE ELECTRONICS IN THE 90'S: PROCEEDINGS OF THE INTERNATIONAL CONGRESS ON TRANSPORTATION ELECTRONICS, Oktober 1990, WARRENDALE, USA Seiten 209 - 215 SUCHOWERSKYJ 'vehicle navigation and information systems in Europe - an overview' ----- | |

INTERNATIONALER RECHERCHENBERICHT

Angaben zu Veröffentlichungen, die zur selben Patentfamilie gehören

Internationales Aktenzeichen
PCT/DE 94/00276

| Im Recherchenbericht angeführtes Patendokument | Datum der Veröffentlichung | Mitglied(er) der Patentfamilie | Datum der Veröffentlichung |
|---|-------------------------------|-----------------------------------|-------------------------------|
| EP-A-0519630 | 23-12-92 | JP-A- 4369424 US-A- 5307277 | 22-12-92 26-04-94 |
| EP-A-0508405 | 14-10-92 | JP-A- 4315077 JP-A- 4315078 | 06-11-92 06-11-92 |
| DE-A-3537730 | 30-04-87 | KEINE | |
| EP-A-0425961 | 08-05-91 | CA-A- 2028459 | 26-04-91 |
| GB-A-2248957 | 22-04-92 | KEINE | |
| DE-A-3908702 | 28-12-89 | JP-A- 2008712 US-A- 4982332 | 12-01-90 01-01-91 |