PATENT APPLICATION

METHODS AND SYSTEMS FOR ELECTRIC VEHICLE (EV) CHARGING, CHARGING SYSTEMS, INTERNET APPLICATIONS AND USER NOTIFICATIONS

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Field of the embodiments

[0001] The present invention relates to systems and methods that enable operators of electric vehicles (EV) to obtain charge and information regarding charge availability.

BACKGROUND

[0002] Electric vehicles have been utilized for transportation purposes and recreational purposes for quite some time. Electric vehicles require a battery that powers an electric motor, and in turn propels the vehicle in the desired location. The drawback with electric vehicles is that the range provided by batteries is limited, and the infrastructure available to users of electric vehicles is substantially reduced compared to fossil fuel vehicles. For instance, fossil fuel vehicles that utilize gasoline and diesel to operate piston driven motors represent a majority of all vehicles utilized by people around the world. Consequently, fueling stations are commonplace and well distributed throughout areas of transportation, providing for easy refueling at any time. For this reason, fossil fuel vehicles are generally considered to have unlimited range, provided users refuel before their vehicles reach empty.

[0003] On the other hand, owners of electric vehicles must carefully plan their driving routes and trips around available recharging stations. For this reason, many electric vehicles on the road today are partially electric and partially fossil fuel burning. For those vehicles that are pure electric, owners usually rely on charging stations at their private residences, or specialty recharging stations. However specialty recharging stations are significantly few compared to fossil fuel stations. In fact, the scarcity of recharging stations in and around populated areas has caused owners of electric vehicles to coin the phrase "*range anxiety*," to connote the possibility that their driving trips may be limited in range, or that the driver of the electric vehicle will be stranded without recharging options. It is this problem of range anxiety that prevents more than electric car enthusiasts from switching to pure electric cars, and abandoning their expensive fossil fuel powered vehicles.

[0004] It is in this context that embodiments of the invention arise.

DETAILED EMBODIMENTS

[0005] A number of embodiments are described below, with reference to specific inventive topics and/or sub-embodiments that relate to electric vehicles, charging methods, wireless device synchronization to exchange information regarding charging events, cloud based processing technologies to share charge availability information, discounts across a charge supply grid, geo-location mapping and charge finding, user interfaces, charge unit identification systems, user interfaces to unify acquisition of charge, reservation of charge, charge units with color indicators to signal charge status and availability, charge supply systems and infrastructure for connecting charge to electric vehicles (EVs), cloud based databases and distributed data centers for tracking charge usage and sharing charge usage with charge providers, utilities, drivers of EVs, owners of charge units (CUs) and owners or managers of charge unit install points (CUIPs).

[0006] In one implementation, the listed embodiments may be viewed broadly to define separate defined embodiments. In other implementation, the listed embodiments may be combined with one or more of the respectively listed embodiments to define unified embodiments. Therefore, the headings noted in the following sections are only provided for ease of reference and discussion, along with the appended drawings.

Embodiment: VOLTP003. Methods for managing universal identifiers (UID) to charge units and charge point install points usable for sponsored paths

[0007] Methods and systems that provide a unified identification system for all charge units. Charge unit manufacturers register their units with an assigned universal identifier (UID); end users "charge unit install points (CUIP)" use the UID to register the charge unit when installed at the CUIP. Owners at the CUIP can access a charge cloud service (CCS) to view their registered charge unit and enter any discounts or promotions at the CUIP. The CCS can then post, publish or distribute the discounts of CUIPs to a site. The site can be accessed via a smartphone, via a vehicle dash electronics interface (i.e., navigation system or car telematics). On one embodiment, an intelligent path generation unit (PGU) can collect information regarding the discounts or promotions offered by the various CUIPs, and based on that data, a route can be automatically generated for electric vehicle (EV) drivers based on their driving paths or mapped driving routs.

[0008] For instance, if a user has programmed their EV to reach a destination (e.g., Point B), from a current location (e.g., Point A), the mapping can population information concerning available CUIPs in the vicinity of the chosen path between A and B. In addition, the discovery of CUIPs and population as information to users regarding a path can be limited or filtered based on the status of the battery of the EV. If the EV is currently full of charge, the user will not be shown CUIPs near the beginning of the path between A and B. As the charge starts to get closer to a low state or state at which the driver should consider charging the EV, the CUIPs in the area can be populated to the display of the user's EV dash graphical user interface (GUI).

[0009] Alternatively, the CUIPs along a round can always be shown to the user, no matter what the level of charge is in the EV. EV users can therefore access an APP to view and find charge units (CUs) at CUIPs and, based on their desired path, various CUIPs are shown as options to the user, with any published discounts identified. In other embodiments, the published discounts or promotions can be displayed in rank order. For instance, the user can filter promotions or discounts in terms of reduced charge rates, products or merchandise offered based on purchased charge, etc.

Brief Description of Drawings

[0010] Fig.1 shows a data acquisition model that includes a data acquisition interface 10 that includes an application-programming interface (API), in accordance with one embodiment. The API, in one embodiment, is constructed to interface with a virtualization infrastructure 16 that stores data in data centers 18. The virtualization infrastructure 16 can be distributed throughout a region, such as by country, e.g., like the United States, or by multi-country jurisdictions, e.g., like Europe or Asia.

[0011] The API 12 allows various types of data creating entities or data consuming entities to share data in real-time or substantial real-time. In the provided example of figure 1, various entities can include, without limitation, charge unit install points (CUIPs). Broadly speaking, a CUIP is a location at which charge is provided to electric vehicles (EVs). A location can be where one or more charge units (CUs) are installed and can access charge from a charge-providing source, such as a local electric grid operator, solar producing panels or cells. When a CU is installed, the corresponding location is the CUIP. The CUIP can be a private location, such as a residence or business, or a public location that provides charge, such as at dedicated charge dispensing stations, parking lots, or businesses. CU will have an assigned identifier, such as a serial number that is universally assigned to the CU, once installed at the CUIP. Once installed, the CUIP is also registered with a serial number that is universally assigned. In one embodiment, the assigning of a universal serial number can be managed by, for example, by a universal serial number assigner module that interfaces with the API. By centralizing the assignment of serial numbers to CUs and CUIPs, it is possible to standardize the deployment of CUs from many manufacturers that that may not communicate with one another. Thus, once CUs are made, such as by CU manufacturers, that data can be shared through the API 12 to the data acquisition interface 10.

[0012] In the same manner as CUs are assigned standardized serial numbers across disparate manufacturers, other players in the electric vehicle (EV) ecosystem, can also take advantage of the centralized assignments of identifiers, such as serial numbers, codes, names, etc. These players can include, without limitation, electric vehicle manufactures. Electric vehicles can be registered either at the time of manufacture or later after purchased by the end user. Registering of EVs can include allowing the owner of the EV to set its own personal level of privacy. For example, some users may not want to be tracked by location at all, while some may which to be tracked for location, but remain anonymous. Tracking a vehicle in anonymous mode will allow users to be notified of special deals or promotions in the vicinity of the vehicle as the user drives around. Yet, the identity of the user will not be disclosed or stored by any database. Thus, the level of tracking can be customized by the end user and changed at anytime on the fly. Tracking of location of the user can be managed as simply as users are tracked as they navigate the Internet. If the user wishes to delete his or her history of travel or permanently delete history of driving, paths, speed, direction, stops, the user can simply login to the cloud service and delete the history. In some cases, the user can set full anonymous driving history mode, by simply clicking a button or setting on the EV's GUI display or by accessing the account via a computer or other personal electronic device (e.g., phone, tablet, etc.).

[0013] Another system to coordinate and transfer data with the data acquisition interface 10 is the electric grid. The electric grid can be a local grid supplier, such as an electric company. Because EVs move around and enter and leave new power grid areas, the power grid suppliers will need to know when more EVs enter their region or are purchased in their region. As more EVs start to reside in a particular region, the demand on the local grid can expand or decline. This information is important for grid operators, as the infrastructure can be better managed and forecasted. For example, if electric vehicles start to increase, say by 10,000 EVs per year, the grid can start to plan for the increase. However, in one embodiment, it is possible to track when each one of the EVs travel into a grid area or region and when they leave the grid area. The travel of EVs into and out of grid areas can also be tracked historically but still anonymously with respect to the identify of the user or owner of the EV. Tracking the travel of the EVs can also be modeled to make projections of growth and can facilitate grid owners to project the need to expand the infrastructure in advance of the need, which reduces emergency expansion costs for grid operators. In addition, it is possible to project when more EVs enter or leave the number of operating EVs.

[0014] The inflow or outflow of EVs into particular regions can be important information that can be used by CU manufacturers. As more EVs enter the market, the CU manufacturers can plan to expand the deployment of CUs into markets with a growth in EVs and EV use.

[0015] Traffic data concerning the paths taken by EVs, where EVs are stopping for charge and where charge is needed. For instance, if particular roads are busier than others, it can be estimated that more CUIPs may be needed along those path locations. Mapping data can also be obtained from mapping entities, and data can be provided back to the mapping entities. For example, accurate mapping data is needed by the EVs, but the EVs can also provide critical mapping data back to the mapping entities.

[0016] The data acquisition interface 10 is also shown in communication with a cloud based charge service ("cloud services"), which communicates with entities, such as

EVs, smart devices, computers, etc. For example, a driver in an EV can access the services to identify CUIPs, map closer CUIPs, map or find CUIPs that have deals or promotions, etc. The driver of an EV can also access these services via any device, whether or not the user is in the vehicle. These services can also intelligently provide data back to drivers based on historical driving actions. For example, if a user drives a particular path or approximate route between points A and B frequently, that historical driving can be used to provide the user with options of new routes or CUIPs that provide better charge options. The cloud-based services can also be accessed by any one of the entities that interface with the data acquisition interface. Access to particular data can be filtered based on the user identification and password, or an authentication method.

[0017] Fig. 2 shows examples of entities that can provide data to the infrastructure or can obtain data, on demand. Cloud services can provide the interface to the disparate entities, and infrastructure can be unified by identifier assignments, as noted above. By way of an Internet accessible interface, user can access the data via smart phones, portable electronics, vehicle electronics, computers, etc.

[0018] Fig. 3 shows an example of a charge infrastructure system (CIS) that can communicate with various entities. The entities can include, for example, charge unit manufacturers, vehicle makers, power grid suppliers, etc. In one implementation, the CIS can include information regarding charge unit types, vehicle type identifiers, power grid demand and information routing logic. The charge location tracker is a module that collects location data from EVs, which defines an EV grid. The EV grid is a map that shows the location of EVs and the paths taken by EVs over time or in real time. In some embodiments, if the user of the EV allows for more data to be disclosed to entities, the information can be filtered at the request of the EV owner/driver, to restrict personal information. However, the user may wish to disclose travel or charge event information to enable the cloud services to provide richer data back to the user, either by way of a mobile application, internet browser, vehicle interface, etc.

Embodiment: VOLTP004: Method for obtaining charge consumption as EV move around and demand from grid

[0019] A data acquisition model that universally communicates and translates charge data to and from entities. Entities can include electric vehicles (EVs), electric charge units (CUs), charge producers, charge grid managers, charge unit install point (CUIP) owners, charge unit (CU) manufacturers, traffic data producing sources, map producing sources, advertisers, and custom interfaces to each entity. Each entity is provided a view into the data acquisition model based on who the entity is and what is relevant to the requesting entity.

Brief Description of Drawings

[0020] Fig.1 shows a diagram of various locations at which the EV may be charged. For example, the EV can be charged at home, at work, at a store, at a charge filling station, etc. The CUIP can be private (e.g., like a home), or public. The CU will have an ID that is assigned by the manufacturer. The ID that is originally assigned by the manufacturer, in one embodiment, is translated into a universally assigned serial number. In one embodiment, the translation can occur at if the manufacturer registers the CU for a particular CUIP. In another embodiment, once the CU is installed at a location, the owner of the CU can register the CU to obtain the universal serial number. The universal serial number can then be used by the cloud services. The cloud services can provide data regarding available CUIPs when the user of an EV wishes to obtain charge away from home. Power grid operators, such as power companies, can also identify the demand of power pulled by the CUIPs. Depending on the demand coming from the grid locations, the grid demand can be calculated and used to monitor investments in power producing infrastructure. In one embodiment, it is also possible to identify if more than one EV is charging at a particular CUIP. This is particularly important if the CUIP is a private residence. This information can be used by grid operators to plan for the increase in power use by the CUIP location. Likewise, if certain CUIPs have fewer EVs charging at that location, whether private or public, it is possible that the CUIP is a poor location for a CU.

[0021] Broadly speaking, the power grid operator can be one that produces power via one or more ways. Such ways can include fossil fuels, nuclear fuels, solar fuels, wind-power fuels, or combinations thereof.

Embodiment: VOLTP005 Mobile Applications that provide charge options to consumers of EVs and User App Sharing and Pairing

[0022] Embodiments are disclosed for user interfaces that provide customized data regarding available charge station locations. In one embodiment, users having other devices, such as smart phones or portable electronics can obtain data, which can be shared with other user interfaces. The sharing can be by way of a sync operation, that can be automatic when the user enters the EV or on demand by the user. In other embodiments, the application or program running on the user portable electronic device can continue to execute the processing, while allowing the display of the vehicle to show all activity on the display. For example, if the vehicle electronics are not capable or processing an application or access a cloud service, the portable device can act as the agent for the vehicle electronics. In one embodiment, the display and I/O of the EV simply acts as a passive interface, while the processing or accessing to cloud processing is done by the user's portable electronics (e.g., smartphone or the like).

[0023] In some embodiments, the user's portable device is already programmed with access codes, passwords, etc., so the user may wish to use the portable electronics instead of having to program the vehicle. This is important when users share a vehicle. If users share a vehicle, one user may have the electronics programmed to their likes or dislikes. By allowing programming, data settings, etc., to be shared or synced (e.g., temporarily or not), users can more easily share vehicles, while keeping the settings that the user is used to having.

[0024] In still another embodiment, allowing the user's smart phone or portable electronics to sync with an EV, users of rental cars can more easily step into cars with pre-programmed settings. Thus, users that temporarily use vehicles need not worry about programming the car's settings upon entering the car, but simply sync with the vehicle to allow the vehicle to run display, IO and services based on the custom settings of the user's portable device.

[0025] This processing that allows users to sync a vehicle with a user's custom settings stored in the user's portable device can also have application to car sharing environments. In big cities, companies allow users to locate vehicles in a proximity to their current location, and simply enter the vehicle using their membership code. In addition to providing users with access to the vehicle, the user/driver's settings can be synced to the vehicle. This can include settings of the seats, the mirrors, the temperature, the radio stations, and the Internet apps to display on the car's display, etc. Custom information, such as prior uses of the car, cost for driving, etc., can be displayed on the car's display, via the sync data from the user's portable device. The sync data can be obtained at anytime, such as by using the user's portable Internet link, etc.

Brief Description of Drawings

[0026] Figure 1 shows that the user's EV can be in communication with cloud services, and the cloud services can be interfaced with data from various entities that provide power for the grid, provide charging units (CUs), provide discounts to charge at particular CUs, geo location services, mapping services, live traffic data, etc. The user of the EV can communicate with the vehicles electronics via a display unit and its associated electronics, can provide input via touch or voice, can request data regarding routs to local charge stations, cost estimates at the various charge locations, how crowded the charge stations are at the various locations, etc. The cloud services are also accessible via a computer that has access to the Internet, a smart device (e.g., smart phone, tablet, etc.), etc. Thus, data can be acquired from various sources and data can be consumed by various sources. The data that is acquired, shared or accessed can be launched on the user's device and then transferred to share in real-time with the display and/or electronics of the vehicle. Thus, a unified access display can be customized to the user, regardless of the vehicle that the user chooses to drive. This is in contrast to current models that customize settings for one vehicle owner or owners. Under one embodiment, the user's settings are seamlessly transferred to the vehicle the user chooses to drive. This is especially useful for cases where a user drives many cars, but wishes to keep his settings constant. Settings can include cloud services, or local settings such as seat positions for the size of the user, mirror positions, radio stations, weather stations, history of routs taken, favorite locations to visit, etc. The application that allows syncing of a user's settings on a portable device to the vehicle electronics is especially useful for car sharing applications, which is common in large cities and may expand in the future. As car sharing increases, it is most useful to allow a user to save his/her settings in their mobile device, instead of relying on the fixed settings of the vehicle. In another embodiment, it is also possible for a user to type in their universal login code (e.g., user name / password) into the car display, and all of the user's settings are transferred to the vehicle while the user is driving the EV. Once the user stops using the EV, the car can go back to the normal mode for another user to login. The data regarding the user's settings would, in this embodiment, be saved in the cloud.

[0027] In one embodiment, user interfaces of a mobile device can share data with the vehicle's display and native apps. App unification allows EV system to display APPS on the user's smartphone device in an opt-in PAIR mode. In one embodiment, this allows one person to enter another's EV, share apps on the EV display while in the EV, and when the person leaves the EV, the Apps de-pair. This auto-sync facilitates sharing of data and also allows users to unify their settings across any number of vehicles the user may drive.

[0028] In one embodiment, the synchronization will enable users to universally transfer settings from portable devices to electronics of a vehicle. In some embodiments, the vehicle that the user wishes to drive is not his vehicle. For instance, the vehicle may be a friend's vehicle, a rented vehicle or a shared vehicle. If the user has programmed settings in his or her device, the settings that are useful for the vehicle will be transferred to the vehicle. Settings can include travel speed restrictions, car seat settings, mirror settings, remote access to home controls (e.g., lighting, garage doors, etc.), radio settings, satellite radio settings, internet settings, etc. In some cases, only some settings are directly transferrable. In other embodiments, a database can be accessed to find a translation metric. The translation metric can include mapping tables that allow for settings to be transferred between functions of one vehicle to other vehicles. In one embodiment, vehicle makers can upload their translation metric for each model and the mapping tables can be used to provide the sync operation.

Embodiment: VOLTP006 Charge Unit Color State Indicators and Apps to communicate charge level while connected to a charge unit

[0029] In one embodiment, methods and systems are provided, which include charge units (CUs), which include a color indicator on the charge station. The color indicator should be visible so that people in the parking lot or vicinity of charging can identify if cars that are connected to a charge station are already charged (or status of charging) and simply taking up space. The charge color indicator can be any color and can be provided with letters or signs to also communicate information, such as empty, 10%, 20%, 30% 70%, 100%, etc. If color is used, one color can be yellow 10A (see fig. 1) to indicate less than 20% full, orange 10B to communicate ~50% full, light red 10C to communicate ~90% full, red 10D to communicate 100% full (or no service available).

[0030] The lights can be provided by any method or be enabled by any lighting technology, such as incandescent lighting, lighting with color coded shields, light emitting diodes (LEDs), and the color can change from one color to another as the charge processes (e.g., from yellow to RED, when full). When users drive up to a parking lot with charge stations (or location of charge), cars connected to the stations publicly show their fill state and if full whether they are just taking up space. If the car is taking up space and the owner of the electric vehicle (EV) walked away, a code on the charge station spot can be displayed. This code can be used by any person to cause cloud services to send a ping or notification to the user/owner of the car. For instance, if the user has left temporarily to shop while the car charges, the user may return quickly upon being notified. This notification may be in addition to the automatic notification. That is, this additional notification may be sent by frustrated users that may want to park in the spot that is taken up by the car. To avoid abuse, the notification may be limited to a set number of notifications.

[0031] In one embodiment, the charge stations may have an ID (like a QR Code, number, text ID, etc.) that the user can use to sync to when plugging in the car. The ID can be used to notify the user when the charge level reaches full or progresses to charge. If the user does not come back to move the car, the user can pay a fee to stay in the spot to avoid citation or charge. In one embodiment, by paying a fee, the color indicator on the charge spot can be kept at a color that is other than full. This will signal to other in the area that the user taking up the spot may be legitimately taking up the spot.

[0032] In one embodiment, the user may be parked/plugged in at a charge unit (CU) located at or proximate to a store (the CU at that location is registered as a charge unit install point (CUIP)). In this embodiment, the store (e.g., a target) can give the user a discount on the charge or space time if they buy X in the store, etc.

[0033] In another embodiment, the user may be at work and plugged in to the employer's charge spots. If the user leaves the car plugged in past the time it needs to fill the charge battery of the electric vehicle (EV), that user may be taking up space that could be used by other co-workers. In one embodiment, when the user plugs into the CU, the user can capture the ID of the CU and register to that charge session. In this manner, the user can be provided notifications as the charge level progresses. The notifications can be by application icons, buzzing, sounds, texts, phone calls, instant messaging, etc. At the time the CU is connected to the user's EV, the user can define how notifications will be sent to the user. The color indicator of the CU can also change as the EV progresses to charged. The same color indicators can be transferred to the owner of the EV as the colors progress to the various colors of charge. In one embodiment, notifications allow users to move their vehicles timely, to allow others to use the CU. In addition, the color indicators provide a way to locally alert people driving EVs if the CUs are actually being used fairly in a particular location, wither private or pubic.

[0034] Figure 1 shows how one user can ID the color state of a CU while the EV progresses to a charge state. In Figure 2, a charge bank A, can be a location where more than one CU is arranged for charging EVs. If a user drives up to a charge bank A and sees that all slots are taken and the color indicators on the CUs show in-progress charging, the user can capture or input a code of the charge bank A. The code can be used to communicate progress information back to the user while the user waits for a charging spot to open up. Instead of having to be physically present to see the charge state of the CUs in charge bank A, the user can login to cloud services to find charge bank A. From a remote location, therefore, a user can see the CUs that are located at the charge bank A, and also see the color indicators of each CU. This can be used ahead of time by the driver of the EV to determine whether he/she wishes to go to charge bank A for charge. For instance, if it looks like spots are available now or the vehicles are nearly all full, the user can opt to drive to the EV to obtain charge from charge bank A.

[0035] Notifications regarding charge bank A or other charge banks, can be provided to the user as the charge levels change for the CUs. This provides a dynamic level of information that can be communicated to users regarding current state and projected states of charge. For example, probability and other logic can be used to estimate available of charge a particular CUIPs along the users projected path of driving or based on the users heading. This information can be provided to the driver so he/she can select where to attempt to get charge and wait the least amount of time. This information can also be blended with cost of charge, in case the user is looking for a lower charge alternative. The notifications can be sent to the user's mobile device (e.g., smartphone or the like). The notifications be sent with color codes or indicators, that show the level of charge of the CUs for which the user is interested. The color notifications can, in real time, be updated as the charge level status changes at the CUs.

Embodiment: VOLTP007 Charge consumption tracking, and grid operators with two-way communication with consumers of charge

[0036] Methods are provided for tracking locations where charge is obtained by users and the progress of charging. In one embodiment, applications connected to cloud services allow user to optimize selection of locations to obtain charge based on occupancy and progress of charge for electric vehicles (EVs) already charging. The vehicles that are in process of being charged are, in one embodiment, in process of a charge event (CE). The charge event can be indicative of a fill state of the EV while the EV is connected to the vehicle. As vehicles are charged, the CE data can be collected by power grid operators. The grid operators can be, for example, the local power stations that provide power to the charge units (CU) that are in process of a CE.

[0037] Figure 1 shows how tracking the CEs, the data can be monitored by power stations to calculate grid local metrics. This data is also stored or exchanged with charge cloud services, which use this data to provide information to the gird operators as well as to operators of EVs. Operators of EVs can access the charge cloud services using their vehicle displays or via electronics (e.g., computers, smart devices, phones, tablets, etc.).

[0038] Synchronizing data between the consumers and the providers of charge enables for efficient distribution of charge and associated consumption by EV drivers. For example, grid operators can provide data regarding energy costs at different times of day, which will also enable real-time changes in electric rates charged at the CUs. In the same way, if the charge rates are high at particular times, users of EVs can find or be informed of better times to charge. This information from grid operators back to consumers in real time provides feedback mechanisms so consumers know of changing rates or more optimal times to charge at particular CU locations. In a way, the grid operators are no longer passive one way suppliers of power, but can also influence the consumption by users by providing real-time data back to the CUs and the cloud services that provide the information to user's mobile applications and on-board vehicle applications.

[0039] Figure 2 illustrates a route providing to a user that drives a common route from home to work. This route may be defined by a user by entering the route into a smartphone or into the vehicle's on-board display-electronics. In one embodiment, when the user traverses the main route, the user could be provided with various charging options along the way. The route can be dynamically adjusted overtime, so that different charge point install points (CUIPs) having charge units (CUs) will be marked along the route. The route can change, such that different days the route will be different, depending on occupancy of the CUs, the cost of charge at the CUs, or the promotions by businesses that may be proximate to the CUIPs.

[0040] In other embodiments, if a user takes a similar route between home and work, on a regular basis, the historical routs taken can be stored to a database. If the user chooses, the route information can be provided to a database. The route information can, in one embodiment, be maintained anonymously. Providers of charge and related merchants where the CUs are proximate thereto, can access the database so that charge discounts can be provided to drivers. For example, the fact that the user, who may be registered drives a particular path will be used by a CU provider to populate discounts to the user. In one embodiment, CUs may not be directly along the path, such as CUs E, F and G, but if one of those CUs provide enough incentive, the time to go off-path will be a benefit. Further, as the user drives along and the charge level changes, certain ones of CUs can populate discounts or prices to the user, as the user drives near a CU that is in proximity to the user who needs charge. Other dynamic updates on available CUs and discounts, based on the position of a user along a path are possible.

Embodiment: VOLTP008 - Charge Unit Install Point (CUIP) owner cloud services

[0041] Embodiments are defined that enable owners of the charge units (CUs) to register their CUs with a cloud service. The cloud service adds the CU to the network of CUs that can be discovered by users that search for charge as they drive around in the electric vehicle (EV).

[0042] The owners of the CUs can, on demand, post the price they wish to provide charge at the CU. In some cases, the owners of the CU can sponsor free charge at their CU, which may bring traffic to the CU and if the CU is in proximate to the CU's business (e.g., a big box store, or any other business), the EV driver may stop by and purchase goods while the vehicle is charging.

[0043] Brief Description of Drawings

[0044] Fig.1 shows a system diagram, where a CUIP owner can login and access a management module, in accordance with one embodiment of the present invention. The owner of the CU, who sets up a CUIP, can login to cloud services to register the CU or CUs of it CUIP. In the process, the user can register the serial numbers of the CUs, such as ID xxxx, and this data is associated with the CUIP of the user. At the management module, the owner of the CUIP or the person have access to the CUIP, can login and set up a profile for the CUs. The profile can be used to identify the charge cost to be offered at particular times of day or based on other factors, such as charge cost from the grid. The programming of prices and rewards can be set ahead of time and can be set to dynamically adjust over time, based on real-time conditions and preset rules.

[0045] In one embodiment, based on the charge cost, the charge revenue based on user's accessing the CUs can be tracked, including metrics of when the CUs are most profitable. In addition, the operator of the CUIP can define custom attributes for the CUs, including artwork to be computer generated for user interfaces (UIs). The specific discount parameters can be programmed by for each CU, the number of users that should be reached with discounts, if the discounts are to be published by the cloud services. The publishing can including, for example, by displaying the CUIP at the top of lists when users search for CUIPs, or based on advertising funds spent for higher promotion of the CUIPs to users of EVs.

[0046] The owner or manager of the CUIP can also set when they desire to get more people to visit the CUIP. This can be done, for example, by publishing discounts at particular times. Still further, if CUIP is made available to users of particular routs, those parameters can be provided by the CUIP owner. This data can then be used to publish the availability of the CUs at the CUIP, based on the parameters set by the owner or manager of the CUIP. The data that is programmed in can be updated at any time by the owner, so that the data published about the CUIP (i.e., availability of charge and rates) can be made available to EV drivers when the owners of the CUIP want.

[0047] For example, if the CUIP is placed next to a coffee shop and coffee sales are slow at 3pm, the owner of the CUIP can change the rates of the charge to a lower value, which may influence some people to choose the CUIP for charge. If the person stops for charge at the CUIP, the user of the EV may simply walk to the coffee shop while he/she waits for charging to progress. In some embodiments, the CUIP owner can also program discounts to the coffee shop, in addition to the charge. Blended discounts can also be provided, such as if the user spends X at the coffee shop, the price of the charge can go down. The cloud services will be able to store the data about the CUIP in a charge unit data store, which is accessible throughout via the charge services connected applications. Thus, as more CUIPs are added to the network, richer profiles can be made based on the data and filtering users of EVs needed to make decisions on where to charge.

Embodiment: VOLTP009 Charge Load Balancing to Increase Charge Speed in multi-EV bays

[0048] In locations where multiple EV charge units CUs are arranged, such as in a parking lot, sometimes some cars are parked in spaces, but they may be full of charge. If a set of charging spots are linked to a local grid, the system can load balance to provide more powerful charge to cars that need charge, while diverting the charge away from CUs where a FULL EV sits connected and forgotten by the EV driver. This would be useful in parking lots that provide charge to multiple EVs, and allowing charge redirection to some CUs will allow more charge to be pumped to the EVs that do need charge. In one embodiment, the CU will included a full sensor (or level of full sensor). The full sensor will set a signal to allow the charge to be diverted to other CUs that are interconnected to a local grid.

Brief Description of Drawings

[0049] Fig.1 shows an example where CUs A-D are provided at a charging bank A. The charging bank A can be, for example, a row or set of CUs at a particular location, such as at a fill station, a parking lot, a parking structure, a home, a yard, a work parking lot, etc. The power grid, as shown in this example, can be connected to conventional utilities (e.g., power company), solar panels, wind power generators or hybrids of these and other power producing units. The power can then be directed to one or more CUs, and electronics at the bank can read the full level of the vehicles, such as vehicles connected to CUs B and D. The cloud services infrastructure (or local electronics) can the perform load balancing. The load balancing is set to increase the power provided to particular vehicles connected to charge stations. Some vehicles have maximum charge flow rates, so load balancing can be adjusted to match the maximum charge load transfer set for the particular vehicle. Other examples are shown, where load balancing is performed to charge vehicles at different rates or adjust the charge speed depending on the state of charging at the various CUs at times ta, tb, tc, etc.

[0050] In some embodiments, certain charge units (CUs) will include more than one charge connectors. If a vehicle is able to receive charge from more than one CU at the same time, the charge speed of the vehicle can be increased. The load balancing for transferring change can also be adjusted based on special charge configurations of the vehicles that wish to receive charge. In one embodiment, the vehicle that signs up to receive charge can communicate with the cloud services, and cloud services can identify the parameters of the vehicle that is requesting charge or is in the process of receiving charge. In one embodiment, the cloud services can notify the user that faster charging can be obtained if the user wishes to connect more than one charge connector to the vehicle, if cloud services knows that the vehicle has multi-charge outlets.

In one embodiment, charging time, power supply, voltage and maximum current play a role in improving charge time. In one embodiment, power supplies may be single phase, three phase, direct current, and voltages for single phase and three phase can range between about 230 Volts AC to about 400 Volts AC, and the delivered current can be between 10 amps up to 70 amps. In some embodiments, direct current (DC) power supplies can provide 40-80kw at voltages of 400-600 Volts DC and amps in the range of 100-150 amps. The higher the amps, the faster the charging time can be.

[0051] In some embodiments, it is possible to supply amps in the range of 1000 Volts DC and amps ratings of about 200 amps or higher, reducing the charging time for a standard size vehicle to about 10 minutes. If a segmented batter is used and multiple charge units are connected to the same vehicle, the charge time can be reduced even further. In one embodiment, CHAdeMO, a method for quick charging a battery electric vehicles can be used, which deliver up to 62.5 kW of high-voltage direct current via a special electrical connector. Other standards are possible, and it is envisioned that the charge delivery can extend much higher than the current 62.5kW, and such higher charge transfer methods shall work with the described embodiments.

Embodiment: VOLTP010 - Cluster Promotions by CU owners in proximate CUIPs

[0052] In one embodiment, a method for clustering promotions is described. When businesses are proximate to each other, the owners are able to cluster promotions to charge units (CUs). In one embodiment, clustering promotions can drive traffic from EVs to stop and get charge at particular CUs. An example is a coffee shop next to a big box store; both can offer discounts for their charge stations, and the discounts can be joined/shared to increase EV traffic to area.

[0053] Cloud services can, in one embodiment, assist in managing the clustering. For example, if one business that provides charge via a CU, can be notified of other businesses that have opted or would like to join in on a cluster promotion program. Thus, participants in providing charge and discounts can be paired based on proximity.

Brief Description of Drawings

[0054] Fig.1 illustrates an example, where multiple businesses may be located proximate to certain CUs. In one embodiment, it is shown that business lot and grocery store each have CUs located proximate to their businesses. It is also shown that box store, having respective CUs is not located sufficiently close to business lot and grocery store.

[0055] Figure 2 shows, an example graphical user interface and logic that may be executed to find CUs and propose clustering. The proximity can be user selected. A user can login (e.g., the owner of grocery store) to find any other businesses that may be proximately located and may be providing charge via CUs. Once the proximity is set, on a user interface by a user, a set of stores may be populated to the user interface. For example, business lot and its CUs may be shown (e.g., CUs M and N). Also shown is a proximate business, such as grocery store, which has CUs O, P, Q. The data regarding the available or proximate CUs can be found using cloud services which may communicate with a geo-location program as well as a database of CUs and user preferences for the CUs.

[0056] For example, if the owners of the CUs post their willingness to offer clustered promotions, those businesses and CUs will be shown. This will allow various owners to arrange a clustered discount. The clustered discount can be, for example, a discount on price of charge, or a discount at business lot and grocery store, or a combination thereof. The owners of the businesses may increase their sales simply by providing discounts to the CUs and EV owners can be notified of such discounts. Notifications can be provided to the EVs in real time, as drivers drive their EVs around. Notifications can also be provided digital devices of users, such as smartphones or other mobile devices.

Embodiment: VOLTP011 - Cloud Services for unification of CUs and CUIPs

[0057] Methods and systems for unifying identification of charging units (CUs), is provided. The method enable charge unit manufacturers to access a cloud services system to register the CU. The CU is provided an ID by the manufacturer and the ID is unified by cloud services. Once installed at charge unit install points (e.g., CUIPs A, B, C, etc.), the owner of the CUIP (i.e., the owner of the location at which the CU is installed). The owner of the CUIP can register the CUs to the CUIP, and assign various status details to the CUs, such as discounts, advertisements, etc. The CU metadata is information about the CU (e.g., where the CU was made, model, use time, status, etc.), the CUIP (e.g., the address at where the CUIP is located, the businesses proximate to the CUIPs, discounts provided at the CUIPs, historical pricing for charge and other services at the CUIP, etc.).

[0058] The metadata about CUIPs and the CUs can be maintained in user accounts on storage of a cloud services system. The data, in some cases, is personal to the owner of the CUIP and CU, and that data can be securely separated to enable better unification and to provide improved sharing of data that is not confidential or has been indicated private. Thus, the cloud services, in one embodiment, will provide privacy controls to protect privacy of all of the entities sharing data via cloud services, from CU manufacturers, CUIPs, owners of CUs and CUIPs, EV owners and users.

[0059] Once CUs are registered with a cloud service, the cloud service can deliver ads from local businesses to users of the EVs; users of the EVs can provide their wish lists, and the cloud service can match the best CUs based on promotions or display ads best targeted to user likes and charge history. In one embodiment, the cloud service will be an ad service, that non-CU owners may post to if their business is proximate to a CU.

Brief Description of Drawings

[0060] Fig.1 shows an example of CU manufacturers providing registration of new CUs as they are introduced into the market. The CUIPs can access the cloud services to register CUs to CUIPs. The network, in one embodiment, performs the cloud services noted herein. In one embodiment, the network can communicate with geo location data managers. The geo location data managers can include third party mapping services, GPS providers, tracking services, mobile phone services, and other internet services. The CU manufacturer data can be storage in a registration database, as well as the CUIP and CU data and metadata updating logic.

[0061] A charge unit data store can hold the various information from CUs, CUIPs, and associated metadata. The various information can be stored in various locations and in a distributed manner at different data stores and processing can be accomplished via virtualization processing systems that enable load balancing across large geographic areas.

Embodiment: VOLTP012 - CU Locate when in proximity with Color ID option

[0062] A method and system for providing parking slot location identification for securing charge, is provided. The method includes defining a map of a parking lot with one or more charge units (CUs). The CUs, as shown in figure 1, can be located through a parking lot or area. The CUs, in one embodiment, will include a light indicator. The light indictors can be, for example, on top regions of the CUs or on poles next to the CUs. The lights can light up, for example, above the level of the cars that are parked in the lot. A driver of an EV can drive into a parking lot, see the lighting of an available CU (e.g., by color code; green available; red occupied, etc.). The lights can have a blinking function, to signify where CUs are available. The location of available CUs can also be populated as displayable data to the display screen of an EV, when the EV gets in proximity to CUs that maybe be available.

[0063] The indication of availability can also be transferred to the user's mobile device, to signify which CUs are available at a particular location. In one embodiment, the CUs and the status of the CUs can communicate such data to cloud processing, over the internet. Drivers of EVs, connected to the internet can also identify where CUs are located in a particular parking area having CUs.

[0064] In some embodiments, the color indicators can be provided on CUs, when not in parking lots. For example, if particular CUs are located outside of a business, the color indicators can have various color shades. Some colors may indicated availability, in-use, reserved, out-of-service, almost done charging, etc. The color indicators can also be communicated to users via notifications. The notifications can be to the displays of EVs or portable devices of the user.

<u>Embodiment: VOLTP013- Charge event or session hardware abstraction</u>

[0065] Methods and systems for automatically plugging a vehicle to a charge station are provided. As shown in Figure 1, a vehicle arrives at a charging slot. The slot may be a parking spot, a home, or a commercial location. The user is notified that the space can charge the EV, if the EV has a charge connector system built-in under the vehicle. The charge station is coupled to the internet and a driver arriving at the slot will be notified how to connect to charge. A charge management system (CMS) is coupled to an auto plug (AP) that can raise up from the ground surface region and automatically connect to the vehicle. In one embodiment, a driver can arrive at the parking slot an will be provided with a sign. The sign can be digital or not, and can provide information as to how charge is purchased or enabled. The sign may include, for example, a QR code that can be scanned by the user's device, or URL that can be typed in, or application that can be accessed, near field communication (NFC) connector, etc.

[0066] The user, once access is made to a user interface, can identify who much charge is needed, or identify the vehicle or account of the user. The AP can then lift up and automatically connect to a plug on the car. The plug on the car can have a door (under the vehicle) that will automatically open when the AP gets in proximity. The door or area around the door can include sensors or identifying markers that can be identified by the AP to enable efficient or accurate plugging by the AP. The user, once connected to a site for enabling charge, can access his or her account, pay for services, set notification services, access discounts, maps, advertisements, etc. The charge cloud services can, in one embodiment, communicate with CMS of the charge unit install point (CUIP) where the charge unit (CU) is located.

[0067] In an alternative embodiment, the charge access protocol can be initiated by the vehicle, that communicates wirelessly with the parking slot to establish a pairing.

The paring can provide the user with information as to how to connect with services of the charge cloud services.

[0068] In one embodiment, charge events detection and session management can be abstracted. In one embodiment, the system can maintain charge allowance separately from the actual hardware of the CU. For example, the user can pay for 10 hours, for example, and use the 10 charge hours at any CU that will provide access to the charge account. In one embodiment, the user's account can be synchronized to the users password to enable access to any number of CUs.

[0069] In addition, if charge is purchased by one user, the charge can be shared to transferred to another user. This transfer of charge credit can be made by wireless device, by accessing an account on the internet, or simply emailing a friend free charge to selected CUs or CUs on a particular network.

Embodiment: VOLTP014 - Plug and Sync to phone/device

[0070] Methods and systems are provided to synchronize user devices with charge units (CUs) to being a charging session. As shown in Figure 1, the user can arrive to a CU 10 with a device 12. The CU can have a display, which can provide instructions for adding charge to the electric vehicle (EV). Figure 2 shows a user that has plugged the charging cord to the vehicle, and has scanned a QR code. Although QR codes are described, other ways to sync the device to a CU to establish a charge session are possible. For example, the CU can provide a phone number, a credit card reader, a password input, a user input interface or touch screen, a bar code, a wireless link via WiFi, internet, or Bluetooth, or other connection interfacing methods and protocols. Figure 3 shows an example screen with instructions, so the user can sync with the device and select the level of charge. The sync operation can also be by way of accessing an app over the internet or entering a code of the CU into an app, which is connected to the internet. Notifications for the user, once charge has begun can also be set, either at the CU or on the user's device graphical user interface.

[0071] Figure 4 shows an example where the user is Bob, and Bob has an established account. The methods of pay, which may have been established earlier or can be established can be noted on the user interface (UI). The discounts available for the CU can also be shown to the user. The discounts are obtained from the cloud services, where the suppliers of charge and local merchants can provide discounts that are populated to be assigned to selected CUs that are registered to the cloud services. The discounts can include, geo data, that identify the discounts provided by local merchants that are proximate to the CU.

[0072] Figure 5 shows an example with a user, e.g., Bob, can get a notification at time t0, where the system can tell Bob that his car will be charged in 5 min. If the user has this notification, the user can return to his car timely, so that the user does not get a penalty for taking up a spot. At time t1, the user can get a notification on his device (e.g., smartphone or portable device having access to the internet) that his car is charged. At time t2, if the user has not yet returned to his car, the user can be provided with a notification that the user must remove his car from the charging spot or else pay a fine or pay a fee to stay in the spot for some time. If the user decides at time t3 that the user wants to stay in the slot, the user can pay a fee to remain in the slot instead of getting a fine. In one embodiment, if the user is located in a store while at time t3, the user can be provided with a notification that the user can purchase some items at the store, e.g., $10, and the user will be allowed to stay in the spot longer. In one embodiment, the CU can have a light indicator that shows the level of charge of the vehicle. If the vehicle is empty or low, the light can be green or orange, indicating that the user is correctly parked and paying for charge. If the charging is done, the light can turn to red. This will notify others in the area that this slot is just holding a car that is full and the user of the EV may return soon. If the user gets the notification and decides to pay for time to say in the slot, the light on the CU may be allowed to remain other than red, so that nearby people will not get annoyed with the car taking up a CU when fully charged.

[0073] Figure 6 illustrates an example of a user's device obtaining a code from a CU at a charge unit install point (CUIP). Cloud services can then allow the user to access his or her account to setup the charge services. In Figure 7, it is shown that an App of a device or EV can connect to the charge cloud services. Figure 8 illustrates an example process when a user logs in to an App, and the App provides the user, Bob, with information about his vehicle. This information can be obtained wirelessly by having the EV send this info to the cloud services, by which the user can obtained the same information on his App. In one embodiment, the App can allow the user to set the amount of charge to add, based on estimated time to fill. This estimate can be calculated dynamically, based on the charge in the car and based on the type and capacity of the CU that the user connects to for charge. Thus, the time estimate can be accurately determined to allow selection of the charge amount to add based on available time of the user. This information can also be translated in terms of miles or distance. For example, the user can be provided with information as to how much time it will take to add charge and how much distance that charge will provide the EV.

[0074] Notifications can also be set for the charge. This allows the user to specify how many and what type of notifications he or she wishes to receive. More settings are also available, such as for the car, the CU, or a combination of car and CU.

[0075] In one embodiment, a user can plug in a car, and then sync phone to the CU. The CU may display a QR code (or other ways as noted above) that sync to a phone, or phone pictures up an RFID tag from charge station (CU). Once the car starts charging, the phone will see the progress indicator change as the charge is going. Once complete, the user will be given a text. While the car is charging, the user can get warnings... e.g., 5 min till fully charged. This way, the user can go back to the car and drive away or move the car out of the charge station parking lot. This embodiment also can be optionally coupled to an auxiliary battery pack, which charges with the main battery. Notifications can be provided on the status of the pack, etc.

Embodiment: VOLTP015 - Charge routed parking structures

[0076] Methods and systems for charging vehicles in structures or areas are disclosed. Systems and structures are provided, which can include ceiling mounted charge cords, as shown in Figure 1. When the user parks, the ceiling mount cord can drop down for charging the car. If the user parks in a spot, the user can look up (or in the proximity) and see a parking slot number above the car. The user can punch in the number into the phone/or car display (or sync to the local communications interface) to release the cord that is lowered or provided so the user can plug in the car. This will give the user charge for the car for a fee and the user can be notified when the charge is done or its progress.

[0077] Fig. 1 shows a parking structure, which can include one or more floors. In one embodiment, the structure has cords that connect to the ceiling and can move along a track. The cords can be delivered to the user's parking spot, and the user can connect the cord to the vehicle. The user can have a vehicle that includes more than one charge cell, and each cell has external connectors to allow more than one charge cord to connect to the vehicle. This is a multi-charge cord connection embodiment, which can also rack the filling of both or more charge cells and provide notifications to the user's device vie charge services.

[0078] Figure 2 illustrates an example with a vehicle has multiple charge cells (e.g., batteries B1 and B2). Each battery can be connected to a different CU, e.g., CU1 and CU2. This will allow the vehicle to charge faster. In one embodiment, the charge units are segmented, to allow for faster charging. Figure 3 illustrates an example where multiple CUs can be connected to multiple charge units (e.g., segmented batteries) of an EV. This provides for even faster charging, when multiple CUs can connect up to a single vehicle.

Embodiment: VOLTP016- Automated charge queue

[0079] Methods and systems are provided to utilize robots to connect charge connectors to a vehicle. In one embodiment, as shown in Figure 1, a car 10 drives up to a slot or space, and a robot with a connection arm approaches the vehicle. In one embodiment, when the user syncs to the robot using a smartphone or device or EV UI, the user is provided with charge options. The vehicle will then automatically pop open the charging door. The door, once open, will provide a path for the robot to inject the charging cord. The robot can insert the charge cord/connector to a side, a front, atop or bottom of the vehicle. The robot can be mounted on the ceiling, on the floor, on a wall, or can move independently on whiles or tracks, as shown in Figure 2.

[0080] Figure 3 shows an embodiment where the robot is connected to a charge track, and can move to selected cars parked in a designated charging area. This allows for fewer CUs to be dedicated to specific spaces. In one embodiment, the charge robot can move on a track to charge cars based on charge reservation. If the user reserves charge, the robot will ID the slot and automatically sync/pair to the car, the car charge door will open, and the robot will start to charge. The user will receive notifications of when charge starts, of estimated time till charge complete and when the EV is fully charged or charged to the level ordered by the user.

[0081] In one embodiment, a user drives up to a charging lane. Once the car is parked, the car's plug opening is left open. The car charging lane is where the car is left so it can be charged automatically by a robot. The robot is coupled to a track on the floor that is beside the lane of cars. The robot has an extension arm that extends a charge cord to the car and connects the charge cord to the car and charging beings. When charging begins, the user is notified and is given an estimate for completion. When complete, the robot unplugs the cord and uses the cord for another car that may be parked in the charging lane. This will allow fewer charge cords to be used to charge more vehicles with fewer charge stations. Essentially, less large units are needed or just one central charge unit for a group area is needed and charge cord(s) can be used to charge multiple cars. Charging can be done by robot or simply providing all cars charge cords to the main central charge unit.

<u>Embodiment: VOLTP017 – CAR DOCK</u>

[0082] One problem with EVs is time to charge. To some people, charging takes too long. The charge problem is two-fold: (1) the battery is large, so it takes time to fill the battery with charge--just like filling a large tank of water and (2) if we think of the battery as a large tank that needs to be filled with water (charge), it would be faster if you filled the thank with more than one hose (i.e., plugs or charge lines). This defines a way of providing two or more charge lines to a same battery to achieve a type of parallel charging of a battery. This example would require a charging station that has a connector that is parallel or larger to provide more current per unit time to the battery. One way to do this is to provide larger connector to the vehicle. However, the larger the connector gets, the harder it is for people to handle. Thus, one way to address this is for the connector to be inserted into the car robotically. This can be done at a type of "car dock".

Brief Description of Drawings

[0083] Fig.1 shows an example of an underneath section of an EV, which is automatically connected to charge by an underground charging system. The system will include sensors that will allow accurate connection to the EV. When charged, the user is notified via a portable device. Logic in the charging system will allow for power and control signals to be exchanged with the EV so the EV and cloud system can exchange data.

[0084] Figure 2 illustrates an example where multiple auto plugs (APs) are connected to multiple EVs from an underground facility. In one embodiment, an auto positioning system, shown in figure 2 will enable positioning of the charge conduit to the vehicle at the correct location. The user can exchange data about the vehicle via a control line that reads status data from the vehicle electronics and storage. This data can then be shared with a cloud charging system, which can sync data with the user's portable device and account on a cloud storage system (which can be accessed with any device having access to the internet).

[0085] In one embodiment, the car dock can be a regular parking space with a metal plate in about the center area of the parking space. Once a car drives into the space, the driver will read code or QR code on the wall or sign post next to the car dock. The user enters this code into the smartphone, which connects, to an APP and Cloud Services.

The driver/user can then select to fill the charge, pay, and set the notifications. While the car charges, notifications will be sent to the user on the schedule set by the user. This way, the user can return to the car dock after the charging is complete. If charging is fast enough, the user/driver can stay in the vehicle and wait for the charge to complete. Mechanically, at the car dock, the metal plate in the parking space will have a scanner that identifies the car's charge port. Based on the type of car and type of charge port on the car, a correct charge cord is raised from the ground and is connected to the user's vehicle for charging.

[0086] Now, because the charging infrastructure is below the car, it is possible to insert a higher current producing cord or plug into the car, while the car is docked at the parking slot. As car makers realize that charging is faster if they include segmented batteries, it may be possible for the car dock to parallel charge multiple smaller batteries to improve charging speed. In one embodiment, the segmented battery can be connected to a port on the bottom of the vehicle that connects to the charge application infrastructure below ground. If multiple car slots are placed proximate to each other, it is possible for the charge infrastructure to divert or load balance more charge to one car or another car based on their selection of charge. The user, via the APP can elect to pay more to get charged in less time, or regular fee for standard charge time or discounts for longer charge times.

[0087] Discounts can also be provided by local merchants, so the user may select to take the discount, knowing that they need to shop for the next half hour or if the car dock is at a restaurant, the user/driver may elect to take the slow charge route. If one car at the car dock elects slow charge, the extra charge bandwidth can be diverted to other cars in the dock system in a load balance shifting based on payment. As cars evolve, mfrs may install wider charge ports on the cars, which could allow for more parallel or larger current loads to the battery or multi-cell battery. Although car dock would benefit from under-ground auto-connection of charge ports, it is possible to have robotic connection to other parts of the car, such as a side panel, top, etc., which may include some user door/slot opening or user guiding of an connection.

[0088] Figure 4 illustrates another embodiment where a vehicle can drive up to a parking spot with available charge connection infrastructure. As shown in figure 4, a charge connector can interface with charge enable electronics and a power grid. The system 10 can also be connected to a cloud charge services system. Figure 5 shows an embodiment where a charge connector at the charging system can automatically engage with a connector of the vehicle. In one embodiment, and by way of example only, a connector on the vehicle can low and catch a connector at the parking slot. Once connected, power can be exchanged. In one embodiment, once the car detects connection to the CU connector, the car can automatically break to avoid pulling the charge connector apart (e.g., at the arrival of the stop point).

Embodiment: VOLTP018 - Cross platform/brand standardized vehicle login/profile management

[0089] Vehicles currently only allow users to program personalized vehicle settings manually in the vehicle. The settings are then saved to either a memory number button on the vehicle or synced to a key fob. The problem is that there is no way to identify the driver of the car to match the individual to his or her settings. The settings are hardware specific, not individual specific. Additionally, there is no current method for an individual to change his or her settings on their vehicle(s) remotely. Additionally, there is no current method for remote administration of a vehicle's settings, or method to review vehicle metrics such as use profiles, service information, and consumption trends from a web connected computer or device. Currently, settings are set and reviewed on the vehicle itself. The vehicle may report on settings and metrics but they will be aggregate for all drivers. There is no way to identify which driver specifically contributed to certain metrics on consumption, use and other service related items.

[0090] There is a need for a vehicle operator profile standard that allows users to maintain their individualized profiles, settings and accounts for vehicles from any internet connected device or be able to log in to their vehicle physically in or near the vehicle by the use of a fob, thumb print, eye scan and or manual login using an input device that interacts with the vehicle's login system. Much like a user has an account created on any computer workstation that registers on a central or cloud distributed system to manage access, any vehicle can be abstracted so that any user can log into any vehicle if they have an account that allows access to that vehicle. For instance, a vehicle owner with the role of “administrator” can create logins to his or her vehicle(s) for additional users such as his or her children, spouse, mechanic, and valet driver among other applications. Logins can be created for individuals or for roles such as the role of “child” where all users with the role “child” would have the same vehicle specifications applied to the vehicle they will be logging into. Similarly, the role of valet can be given and shared by any valet driver.

[0091] The purpose of abstracting vehicle operators from the vehicle itself is a shift from the current state of the art in which settings are vehicle specific- each vehicle typically only having only the ability to store 1-3 sets of settings, to where vehicle settings are user specific and 1-n logins can be managed through an access management system. This allows each user to apply his or her settings to any vehicle based solely on their login information in which they provide their login and password. When a user logs into a vehicle, the vehicle will determine locally on board and/or communicate remotely with a central or distributed access management system to determine the validity of the login presented to the system. If the user's login is recognized, the system will apply all settings and use privileges to the vehicle prescribed by the login.

[0092] Logins can have role specific settings and privileges or settings and privileges set only be the administrator that cannot be overridden by the user of the login. For instance, an administrator may create a login for "John" their 16-year-old son. The administrator can apply settings to John's login that John cannot override such as the maximum speed the vehicle can travel. For instance, Although the vehicle may have the ability to travel at a speed of 130mph, John's login will only allow the vehicle travel at a speed of 90mph. Additionally, every login may have settings that the user of the login can toggle to their liking such as the list of radio stations they would like pre-programed every time they log in to any vehicle that accepts their login.

[0093] Logins can control all aspects of a vehicle's behavior and can be attributed to individuals or roles. These settings can be toggled via a network connected device such as a computer, web application, smart phone or directly on the vehicle. Administrators can decide which settings are locked for specific logins or roles, which are open for the login user to toggle and which settings are to be enforced depending on the time or year, or time or day etc. Login settings that can be set and remotely administered include but are not limited to, driving characteristics (rate of speed, fuel consumption guidelines) location based settings (GPS aided travel restrictions, travel radius boundaries, dynamically loading maps, dynamically loading directions, dynamically loading fuel, charge and battery service and purchase locations etc), Time of day based use restrictions (day driving only for example), automatic purchase settings (financial institution linking for automatic purchasing of fuel, charge time, batteries, car washes, etc), fuel settings (Electric only, fuel only, hybrid only etc), refueling routing and purchase (incentive based re-fueling maps, incentive based refueling offers etc) driving characteristic settings (sport, comfortable, soft, off-road, high performance, economy mode), entertainment system settings (radio memory settings, internet access or restriction, streaming services settings), comfort & HVAC settings (climate control, seat positions, seat heater/cooler, suspension/ride settings, entry lighting, remote start, remote stop etc) tracking/metric settings (camera/video recording guidelines, mileage, top speed, average speed, MPG, wear and tear settings and notifications, historical travel maps).

[0094] Additionally, combinations of settings or setting profiles (such as “sport” where your seat moves to sport position for additional support, suspension stiffens, throttle response becomes aggressive etc.) can be set as well instead of individually setting use characteristics. Logins are user specific, not vehicle specific, so any family member can use their login on any family vehicle and the vehicle will perform based on the metrics and restrictions dictated by the login used to operate the vehicle.

[0095] Companies can create and manage logins to company vehicles for delivery drivers, car washers, mechanics among other applications. Each login can be configured to provide or restrict access based on the user logged into the vehicle. A company may only allow a delivery vehicle to travel at a maximum speed of 80 mph to limit reckless driving. A company may create a role of “local delivery only” where a driver with that login can only drive the vehicle within their territory. Breaches in territory travel will result in a recorded event and notification to the vehicle administrator as well as the vehicle operator. A grace period will be given to re-route back into the driver’s territory before more aggressive vehicle disabling mechanisms are deployed. The driver will be given visual and audio cues as to how to avoid vehicle disabling.

[0096] A dealership can grant "test drive" logins to potential customers, which allows them to operate under 100mph and only within a 5-mile radius.

[0097] A valet can be given a password to login only as “Valet” which will impose restrictions on trunk operation, vehicle speed operation, vehicle location notification settings etc. A recording option can be provided, which can set a recording within and around the vehicle when in the valet mode. This way, the user can login to see what the valet driver did while in the car, in case the owner feels that something is not correct. Additionally, while the valet is driving the car, a notification can be provided to the valet that will alert the valet that recording is in progress, and their face can be shown on the display while the valet parks the car.

[0098] A user may set the valet login to alert the user that left the vehicle with a valet that the car has traveled beyond the allowed radius or has reached a speed greater than 100mph for example. This alert can be sent wirelessly to an email address, texted via mobile phone number or sent to a mobile device having a login-profile mobile application capable of sharing current vehicle location, speed, fuel status among other metrics. The last logged in user of the vehicle or vehicle administrator can send visual, audio or auto override notifications to the valet letting them know they need their car back, they are traveling too fast or even auto shut down to prevent theft.

[0099] A parent can set up a login to the family vehicle for their child that only allows the child to drive within a certain radius. For example the vehicle may only be used to drive between home and school- a map can be outlined on the account management interface by a parent when setting up the child’s login.

[00100] A parent or company may give a child or company driver a login that also carries a financial allowance connected to one or more financial institutions administered through the access management and/or login management system by administrators. For instance, a child may have the need to re-fuel the vehicle by purchasing either traditional fuel, battery units, and or charging time but a parent does not want to give a general credit card to the child. The parent will set a budget for fuel purchase for the given login and the login will then allow the vehicle will communicate with the fuel, battery, and or charge-dispensing unit automatically using a wired or wireless communication systems funding the purchase automatically up to the allotted budget set in the login of the vehicle. This may be useful for fleet vehicles where company vehicle users currently use a corporate credit card to purchase fuel where fraud may exist in the form of using company credit cards, or company fuel accounts to fuel personal vehicles. The new system ensures only the company owned vehicle is approved to purchase the traditional fuel, battery, charging time and also maintains metrics on which logged in user consumed fuel and re-fueled which vehicle.

[00101] A standard can be created so that all manufacturers use the same type of login/access management system. This way, any user can log into any vehicle from any brand in so far as they have account creation access or a recognized login. Once logged in, each vehicle will receive and impose the login-based settings as long as the manufacturer supports the login/access system.

Brief Description of Drawings

[00102] Figure 1 describes the various methods a user can interact with a vehicle login system. The user may use any network-connected device ranging from a mobile computer, mobile phone, mobile network device all connecting to a remote converged or distributed network cloud system. The user may also interact with the vehicle login system directly on or near the vehicle. The user supplies login credentials to a vehicle login interface which are sent to the remote distributed or centralized user login authentication system or onboard vehicle authentication system. The processing logic receiving the login credentials processes the data and returns an authentication response to the user attempting to log in. If the authentication is a success, the vehicle the user attempted to log into has vehicle settings applied to it and the user is allowed to operate the vehicle. If the authentication is a failure, the user is presented with a failed access notification on the login interface.

[00103] Figure 2 shows two different types of users and an example of the data each user is organized by. In this case, User 1 is an administrator of a vehicle login system over vehicles he or she owns. User 1 has the ability to add or remove logins, roles and vehicles to his login system. Since User 1 is an administrator, he or she can add more logins and or roles to the system to allow a family member to have access to the family vehicles for instance. In this case, a family member "User 2" is shown. The administrator has given this family member a login named User 2 and has granted two roles to User 2. User 1 may only want User 2 to have access to a certain vehicle and to certain roles only. User 1 may only want User 2 to have access to the vehicle for the purposes of traveling between school and home. In this case User 1 has created a role that is applied to User 2, which only allows the vehicle to travel within certain restrictions and geographical locations. User 2 does not have the ability to alter his or her login, role or vehicle since they do not have administrator access. However, User 1 can make changes on behalf of User 2. The full range of settings over a vehicle that applies to a given role or login is a super set of settings. User 2 may have access to a subset of settings that User 1 allows changes to by User 2.

[00104] Figure 3 shows a graphical representation of a possible set of settings an administrator such as User 1 may have to administer logins, roles, and vehicles. Figure 3 further expands the depth of settings including but not limited to vehicle administration, adding or deleting users and roles, vehicle global settings that apply to all roles and logins, adding or deleting vehicles among other settings.

[00105] Figure 4 shows one sample of many potential configuration settings for a given vehicle. In this case, User 2 has a login created for him or her named "CHILD". This login contains a set of settings that may or may not be configurable by User 2 since User 2 is not an administrator, only a subset of settings are open to him or her to alter. The drawing illustrates the settings that are user editable and admin only or restricted. The left column lists the type of settings corresponding on the same row on the right column. These settings are examples and may be altered, added to, or subtracted from in different embodiments. For instance, Fuel use settings allow an admin in this case to choose what type of fuel the user login CHILD is allowed to consume while logged into the vehicle. Similarly, location based settings allows an administrator to draw out a map of the area the user login CHILD is allowed to travel within while logged into the vehicle.

[00106] Figure 5 describes extended settings from Figure 4. This figure describes additional vehicle settings that are configurable by the user with the login "CHILD" and those that are only configurable by User one being the Administrator. Figure 5 also describes a subset of settings a user login CHILD in this case is allowed to change. For example, the user login CHILD is allowed to select his or her radio stations, streaming services, and Internet access settings for a unified experience in any vehicle they log into using this log in. Similarly, the user login CHILD can access driving modes and set the vehicle mode to sport for instance.

Embodiment: VOLTP019 - Vehicle accident avoidance

[00107] Currently, vehicles maintain very valuable information regarding where they are, where they are heading and their destination maintained which is maintained by GPS and navigation systems on board. The wealth of information collected and maintained by every vehicle is mutually exclusive meaning that only each individual vehicle is aware of its own heading, rate of speed and current location. This information, if crowd sourced and crowd shared/consumed, can become very powerful in use for accident avoidance. By networking vehicles within a certain radius together, all individually location-aware vehicles become also aware of all other vehicles in their sphere of influence. Every vehicle will network with vehicles in their range using wireless communication systems such as but not limited to Wi-Fi, Wi-Gig LTE, cellular, radio, near field communication or other method.

[00108] Each vehicle will maintain a table of all other vehicles in, entering, and or leaving its sphere of influence. Every vehicle will maintain and continuously share it's own heading, speed and location. An algorithm on each vehicle will continuously compare the current vehicle's speed, heading and location with that of all other vehicles in its sphere of influence to determine if a collision may result.

[00109] A vehicle collision is not a single event; it is the intersection that happens between two vehicles having intended paths, headings, and speeds that perfectly collide at some point in the future if course correction is not taken. Thus, an algorithm may be able to predict the probability of a future collision where a human may not and alert the driver to alter heading and/or speed. The system will have the ability to enact passive and active accident avoidance vehicle maneuvers in proactive action to an imminent collision.

[00110] The system may alert the drivers to change their rate of speed, heading, or location. The system may give each of the two drivers custom messages such as telling both drivers to veer right so they don't steer into each other. The vehicle may also automatically provide audio and or visual alerts such as honking the horn or flashing headlights to alert the other driver. Active accident avoidance may engage if certain collision is immanent within a certain threshold such as within the next 50ft for example. In this case, both vehicles, being aware of each other, will engage in an automatic and complementary accident avoidance maneuver such as slowing down, steering away from impact and or both. The vehicle may engage secondary methods of identifying imminent collision such as radar, sonar, infrared or other secondary object identification method to ensure the predicted collision is not a false alarm.

[00111] The vehicle's cameras can be engaged to take still photos and or video record any incident, whether it results in a successful avoidance or impact. This footage can be used to alert authorities of the severity of the accident and aid insurance companies in identifying fault. A vehicle will maintain a buffer of events for a given amount of time before and after a collision event or collision avoidance event such as the location, speed, heading, and avoidance measures to store and identify the metrics that lead to an incident.

Brief Description of Drawings

[00112] Figure 1A shows a collection of vehicles all having independent headings, speed and location. Each of the vehicles shown has the ability to become aware of all of the other vehicles within a range. Car 1, being one example, shows a sample radius of awareness around it. In this example, Car 1 is aware of Car 11, Car 5, Car 9, Car 8, Car 7, Car 3, Car 6, Car 2 and Car 4. Car 1 also keeps track of their heading, speed and location at any given time. Car 1 also knows that Cars 2, 4 and 9 are leaving Car 1's sphere of influence. Car 1 also knows that Cars 7, 11, 2 and 6 are entering Car 1's sphere of influence. Just how Car 1 is aware of all other vehicles around it, all other vehicles shown in this diagram behave in the same manner. For instance, Car 1 is not only keeping track of all other vehicle's in its vicinity, Car 1 is also broadcasting it's speed, heading and location information so all other Cars in this diagram are aware of it as well.

[00113] Figure 1B shows one vehicle, Car 1, communicating wirelessly with all other cars around it. In this sample, Car 1 is sending its heading, speed and location to all of the other vehicles within communication range and also receiving every other vehicles heading, speed and location within communication range. This is one example, however, all other vehicles within communication range (Car 2, 4, 8, 5, 3, 6) are behaving in the same fashion. Car 3 for instance may not be aware of Car 2 because it is not in communication range.

[00114] Figure 1C shows an instance of an asynchronous network in which all vehicles within a certain communication range can "talk" to each other using the same protocol. In this case, the protocol used can be Ethernet through wireless mediums such as 802.11a, b, n, ac, ad or any other wireless communication protocol.

[00115] Fig. 3 shows a sample system with interfaces, data storage structures, sensor inputs, algorithms and vehicle control systems used in collision avoidance on board each vehicle. Each vehicle will have a network interface, which communicates with other vehicle's network interfaces. Each vehicle will store all data coming in from other vehicles in communication range. This set of data will be kept in a table of all vehicles' metrics including but not limited to speeds, headings, locations, destinations, driving characteristics and acceleration. Similarly, each vehicle will maintain a table of its own metrics including but not limited to speed, heading, location, destination, driving characteristics and acceleration. This data will be passed to other vehicles using the network interface. The vehicle metrics and data are collected using a variety of sensors including but not limited to optical sensors, mechanical sensors, and networked sensors among others. Each on board computer on each vehicle will use data coming in from other vehicles together from data captured by the vehicle itself to feed a collision detection and prediction algorithm. This algorithm will activate a collision management system that interacts with the vehicles control systems including but not limited to audio alerts, visual alerts, horn, headlamps, steering, braking, video and camera recording, safety restraint systems. The collision management system will engage any combination of active and or passive collision avoidance maneuvers using the vehicle's control systems. For instance, if two vehicles are traveling on intended paths that will result in a head-on collision, the systems on both vehicles will calculate if an early warning will suffice. Each of the two vehicles will alert their corresponding driver via audio or visual alert. If the drivers do not correct their intended path and a collision is still predicted by the algorithm, more aggressive systems will engage such as applying braking power or steering the one or both vehicles away from each other.

Embodiment: VOLTP020 - Charging parking spots, reservation system and localization system

[00116] Currently, when we drive to our destinations we are unaware where we will park our vehicle. We are also unaware of where we will charge our plug in vehicles as well. If our destination is popular restaurant, a busy part of town, or a location where parking is scarce, the chances of finding an open parking spot are low. Moreover, the chances of finding a parking spot with vehicle charging capabilities are lower.

[00117] As more parking spots are becoming smart parking spots, there is a need for a remote reservation system to assist drivers in finding open vehicle charging parking spots as close as possible to their destination.

[00118] A driver can input their destination, destination time, destination length of stay among other metrics either from a computer, or any networked device to the charging parking spot reservation system. The system will then search a radius around the user's future destination and return a listing of charging parking spots, time of availability closest to the user's arrival time, charging pricing, length of time available among other information. The inventory of charging parking spaces would be similar to the inventory of meeting rooms in an office environment. Just like an office worker can browse a listing of open meeting rooms and book them in advance, so can a charging parking spot user pre-book a parking spot close to where they will be needing to park for their dinner reservation, event reservation, next to their place of work, next to the next errand location among other applications.

[00119] A user can book their charging parking spot in advance and pre pay not only the parking fee for the amount of time the car will be taking up the space, but also pre-pay the amount of charge time the user will be using. The amount of parking stay and the amount of charge time do not have to be the same. The user can book an hour in the charging spot but may only need 30 minutes of charge. The charging parking spot will either stop charging when the 30 minutes are up or when the vehicle is full of charge. If the vehicle charge becomes full before the 30 minutes of charge are up, the user can receive a credit for their next "park and charge" or a refund to the financial institution of their choosing.

[00120] The reservation of parking time and parking charge time may be done in advance or may be done by "single touch". If a user has not pre-booked a charge spot, they can do so on the fly. For example, a user drives to their intended location but is unaware of the closest park and charge location. Instead of driving around to visually find the park and charge spot, the user can ask the system to find and reserve the closest spot on the fly. The user can browse through locations that fit the user's needs. For example, 3 results may return for park and charge spots near the user. Two of them are only available for 30 minutes; one of them is available for 1 hour. If the user needs one hour, the user can reserve and pre-pay park and charge time for the spot. The charge and park locations may be incentive based. The user may be presented with the latest deals and incentives to park at certain locations. The user may chose to park and charge at the location that offers the best deal or coupon. Once a park and charge spot is reserved and confirmed, either in advance or on the fly, the user is sent a confirmation as well as automatically sent navigation and address information which can be integrated or sent to the vehicle to aid in finding the reserved spot.

[00121] The park and charge reservation system will also have a mobile application component that will alert the driver when their park and/or charge will be expiring as well as provide periodic reminders of their expiration time. If expiration time is approaching, if available, the system will present park time extensions, if not, the user will need to move their vehicle to avoid overage charges and or fines. These overage charges may be automatically charged to the reservation system user's account or mailed to the address on file.

[00122] Park and charge locations that have been reserved by another user will not allow parking or charging to another user. If a user attempts to park or charge at a location already reserved by another user, audio, visual and or mobile alerts will be sent to the driver to remove their vehicle or face penalties. If an infracting user does not remove their car, a notification will be sent to the original user that reserved the spot with alternatives such as a new list of park and charge locations to transfer to, or refund options.

[00123] Once a user has parked at their reserved and paid park and charge location and the user has paid for charge time, the vehicle may be charged by induction, wirelessly, by a retractable conductor or by manual or robotic charging vessels. The intelligent park and charge location will be a smart pad that has its charging mechanism embedded in the concrete or asphalt. It may also be a modular bolt on solution. In either scenario, the smart park and charge location will be able to communicate and identify the vehicle and user so that the system knows how to dispense charge, how to bill and when to update its records.

Brief Description of Drawings

[00124] Figure 1A shows two conventional parking situations. One situation is a conventional parking lot where vehicle parking spaces are arranged in a variety of fashions next to each other. Each parking spot can be built at the time of parking lot construction to include vehicle-charging pads under each parking spot or can be retrofitted to include overlay or underlay vehicle-charging pads. Similarly, this arrangement can be applied to conventional street parking.

[00125] Figure 1B shows a parking spot that has one such vehicle-charging pad. Each pad having a charging computer, a charging surface, and a charge indicator and interface.

[00126] Figure 2 shows one such conventional parking spot from the top view showing the vehicle-charging pad in relation to a conventional parking spot and a side view. The side view shows the relation of the vehicle-charging pad to the conventional parking spot in either an embedded or overlay fashion. A conversion kit may be utilized in order to convert an ordinary conventional parking spot into a parking spot with vehicle charging capabilities.

[00127] Figure 3 shows the interaction between a vehicle and a charging pad located on a conventional parking spot. In this embodiment, the vehicle shown is interacting with the vehicle in two possible fashions. One such method is by retractable charging conductor and the second method is wireless charging/charging by induction. This vehicle charging pad view also demonstrates one such charging computer location as well as the possible vehicle charging pad power sources. Vehicle charging pads can be powered by any of the following sources or a combination of the following sources including but not limited to solar power, power station, power grid, fuel cell, quick discharge capacitors among others. In solar technology embodiments, it is envisioned that it is possible for some Charge Unit (CU) to be supplied with all or part solar power, to reduce the strain on the conventional power utility grid.

[00128] Figure 4 shows one vehicle charging pad embodiment having the ability to interact via network interface with other vehicle charging pads or vehicle charging parking spots, reservation systems, payment systems, charge indicator interfaces and logic, charging and dispensing logic, vehicle identification systems, location and GPS information, service requests among others. The charging unit computer controls the operation of the charging surface or pad and it's systems and interfaces. In this example, the vehicle charging spot has the ability to take incoming charge/parking reservations remotely via network, send responses back to the reservation system via network and communicate in an asynchronous fashion.

[00129] Figure 5 shows one such scenario where a user, through a reservation interface (on board or remotely via any networked connected device) can send their current location, destination location, reservation search radius max, charge time required, park time required, payment information among other metrics to a park and charge reservation system. The reservation system queries available park and charge locations using the criteria provided by the user and responds to the user with confirmations, directions, maps, receipts, parking space availability listings and maps, charge status alerts among other metrics and indicators.

Embodiment: VOLTP021 - horizontal / vertical acceleration and electricity generation

[00130] As vehicles travel on a plane they are subject to horizontal and vertical g-force acceleration. This acceleration is currently not being used to its full potential. These forces can be used much like regenerative braking is used to produce electricity to charge a vehicle battery or drive a vehicle electric motor. Force inertia from a vehicle's travel is maintained in the direction of travel even as the vehicle changes directions. This produces brief horizontal and vertical g-forces as a result of the vehicle switching heading and or speed. These forces are also generated under acceleration and deceleration. Induction can be used to harness these changes in vertical and horizontal acceleration to produce an electric current much like a watch that can run after being shaken, or much like a flashlight that can be charged by shaking it.

[00131] A vehicle can have a system of acceleration harnessing, electric current producing mechanism built into the car when it is manufactured or it can be a bolt on system to aid hybrid and or all electric vehicles recharge on-board batteries or drive the vehicles motor.

Brief Description of Drawings

[00132] Figure 1 shows a side view and a top view of a vehicle with possible vertical and horizontal acceleration indicated. When a vehicle is under acceleration, or deceleration, the force can be harnessed via electromagnetic induction to produce a current that can then charge a vehicle's batteries or motors. Acceleration or deceleration also causes variations in vertical acceleration as the front of the vehicle rises or falls as well as the rear of the vehicle rises or fall depending on the type of vehicle behavior. These forces can also be harnessed to produce electrical current.

[00133] Figure 2 shows various vehicle behaviors and the acceleration result. For instance, increasing the speed on a vehicle causes vertical acceleration as well as horizontal acceleration.

[00134] Figure 3 shows one such method of producing current via induction. In this example, a conducting coil surrounds a magnet. When the magnet travels within the coil, the movement of flux induces an electric current that is carried through the coil. This current can be harnessed to charge vehicle batteries or drive vehicle motors. Using this example, these systems can be placed in vehicles to harness forces caused by acceleration moving magnets back and forth within coils to produce current. The magnets can be on rails that allow them to flow back and forth fluidly with the least amount of resistance possible. As the vehicle moves or accelerates vertically or horizontally, the magnets flow creating an electrical current.

[00135] Figure 4 shows an application of the current producing induction systems that can be placed on/in a vehicle. As the vehicle creates acceleration forces, induction causes electrical currents from each induction unit. The electric current can be captured and fed to vehicle batteries or vehicle motors.

Embodiment: VOLTP022 - Hybrid vehicle + Fuel Cell

[00136] Today's hybrid vehicles run on a combination of traditional fuel and battery power. The power to charge a hybrid vehicle's batteries and drive its motor is provided by plugging a vehicle into a power source or regenerative current. When a hybrid or plug-in vehicle exhausts its fuel and/or electric charge it is no longer operational.

[00137] A traditional hybrid system or all-electric plug in vehicle system can be combined with a fuel cell system to provide extended range. Fuel cells produce current by introducing a compressed gas, commonly hydrogen that is pressed against a catalyst having oxygen (sourced from the environment) on the opposite side of the catalyst. A current is produced as electrons are lost to the creation of H2O- a by-product. This current can be used to charge a vehicle's on board batteries to ease range anxiety and to extend the range or a hybrid vehicle. This system can be used as a reserve power source when a charging source is not near by. Normally, in fuel cell systems, H2O is produced and is lost as is drained out of the vehicle requiring a new fill of hydrogen (H2) to repeat the process.

[00138] In this new system, the H2O byproduct can be re-introduced into the system by storing it in the system as it is produced. When the vehicle reaches a location where a charge and thus an electric current can be introduced, the current can then be passed through the water byproduct causing electrolysis which splits and harnesses the H2 from the O restarting the cycle. Regenerative breaking, roof solar panels or a wall outlet can provide this current for the electrolysis. This fuel cell can be stacked to act as a long range battery to supplement traditional acid, or lithium batteries / traditional fuel.

Brief Description of Drawings

[00139] Figure 1 shows a traditional fuel cell system with an enhancement that allows a vehicle fuel cell system to recycle byproducts. Traditional fuel cells take fuel in such as Hydrogen and presses the fuel against an anode and electrolyte. The opposite end of the fuel cell takes in air from the atmosphere where the oxygen is pressed against a cathode and electrolyte. As the Hydrogen and oxygen combine an electric current is produced which can be used to charge a vehicle's batteries or motors. After this reaction takes place, a byproduct is produced in the form of H2O. This H2O or water is then disposed out of the system. In this enhancement, the water is retained in a holding tank where it can be used to product the hydrogen fuel and oxygen by splitting the atoms using electrolysis.

[00140] Electrolysis utilizes a current to separate the hydrogen and oxygen atoms apart. Electrolysis can be achieved through solar power produced on board a vehicle, by plugging into the grid or by current produced during regenerative vehicle braking for instance. The hydrogen atoms can be harnessed and stored as fuel to restart the traditional fuel cell cycle and the oxygen atoms can be used to react with the hydrogen atoms thus creating the current as before. This system works to extend range on vehicles with hybrid power systems in which a vehicle may be powered by rechargeable batteries, plug in, traditional fossil fuel, fuel cell or any combination there of.

Embodiment: VOLTP023 – Electric Vehicle Charging Units with Auxiliary Batteries

[00141] Methods and systems for charge units that can include user interfaces and connections with auxiliary batteries. In one embodiment, a charge unit (CU) 104 can be installed in various locations, such as a garage 100 of a home. The CU 104 can include a display graphical user interface (GUI), a wireless connection 105 for communicating with cloud charge services. The display GUI 106 can provide various types of information, such as the charge level of the vehicle 102. The CU 104 can be connected to the vehicle 102 via a plug 109. The vehicle 102 can include a trunk where an auxiliary battery 120 can be inserted to extend the range of the vehicle 102. The auxiliary battery 120, as shown in figures 2 and 3, can include connectors that can connect to the CU 104 to collect charge and exchange control data. The control data can be charge levels of the auxiliary battery 120, so the information can be displayed on the CU 104. The auxiliary battery 120 can be moved into the trunk or some other area of the vehicle. Once in the vehicle, the auxiliary battery 120 can be connected via a connector 122 to a connector 124 of the vehicle 102.

[00142] In one embodiment, figure 4 shows an example of a display GUI of the CU 104. The display can provide data, such as charge level, last recharge, pairing, notifications, battery life for the auxiliary battery, sync settings for the cloud app, etc. The interface can include location identifying controls to find CUs, by selecting Charge Stations. Service button to find service for the CU or the EV. In figure 5, the user holding a device 150, such as a smartphone or internet connected device, can connect to cloud services. The cloud services can provide data regarding the charge level of the vehicle 102, the status of the auxiliary battery 120, the level of charge of the vehicle 102 via exchange of data from a synchronization (sync) to auto logic 132. The display 130 of the vehicle 102 can also sync to data on the device 150.

[00143] In one embodiment, figure 6 shows the vehicle 102 connected to a CU 204 that is a public CU, at a CUIP 350. The vehicle has the auxiliary battery 120 and a main battery 180. The CU 204 can connect to the vehicle 102 via cord 208.

[00144] Figure 8 illustrates an example of cloud services 300 interfacing with the vehicle 102. The CU 204, connected by cord 208 can connect to point 109 of vehicle 102. Interface 190 will provide a junction that is controllably connected to one or both of the main battery 180 or auxiliary battery 120. The vehicle 102 can include automobile logic 132 and display 130. The automobile logic 132 can communicate with the internet and the cloud services 300. Cloud services 300 can be connected to a number of systems and subsystems. One subsystem is an advertising backend 330. Advertising backend is an interface that allows publishers of advertising to submit ads to be forwarded to EVs, CUs, and others in the chain of charge systems. For example, CUIP owners 350, business owners 360, and other 3rd party entities can submit and post advertisements. The Cloud services 300 can also be connected to utilities backend 320, home charging costs 322, public charging costs 324, etc. In addition, the cloud services 300 can also be connected to data sources or metrics stored for handling status 302, charge locator apps or routines 316, maps and GPS 314, maps that find closest CUs meeting particular criteria, sponsors 310 that may sponsor free or partially paid charge a certain CUS, and discounts 312. Again, the cloud services is a system that manages interfaces to EVs, CUs, manufacturers of CUs, utility companies, users of such information, advertisers, partners that make parts for CUs, that make parts for EVs, or sell and make EVs.

[00145] In one embodiment, when information regarding EVs historical use, paths taken during the life time of EVs, maintenance called for EVs, maintenance for CUs, etc., is collected, the data can be used to plan for future events. Future events can include, for example, upgrades to CUs, improved data distribution to drivers of EVs, etc. Historical use of "notifications" can also be used by EV makers and CU makers to improve the performance of CUs and data mine the information to enable improved deployment of new CUs and EVs.

[00146] Embodiments are described with reference to methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes drained/used, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[00147] In one embodiment, the auxiliary battery compartment is configured to hold a plurality of smaller batteries, referred to herein as "volt bars." A volt bar should also be interchangeably viewed to be a "charge unit." The charge unit is a physical structure that holds charge, as does a battery. A charge unit can also be a fraction of charge, which may be contained in a physical structure.

[00148] Broadly speaking, a volt bar is a battery that can be inserted into an auxiliary battery carrier. The auxiliary battery carrier, or compartment, can be lifted by human and placed into a vehicle, such as the trunk of the vehicle. The auxiliary charging carrier can then be removed from the vehicle to provide charge to the volt bars contained within the auxiliary battery carrier. For instance, owners of electric vehicles can purchase an auxiliary battery carrier and fill the auxiliary battery carrier with a plurality of volt bars.

[00149] In one embodiment, the user will charge all of the volt bars by charging the auxiliary battery carrier before the auxiliary battery carrier is placed into the vehicle. In one embodiment, the auxiliary battery carrier, and its volt bars can be charged utilizing the charge provided from the main battery. For instance, if the vehicle is charged overnight utilizing the primary charging receptacle, and the auxiliary battery carrier is connected to the vehicle (containing volt bars), the volt bars in the auxiliary battery carrier will also be charged. In one embodiment, once the main battery and the vehicle are charged, the charge will then be transferred to the volt bars contained in the auxiliary battery carrier. As such, charging the vehicle will accomplish the task of charging the main battery as well as the auxiliary battery carrier that includes a plurality of volt bars. In another embodiment, the volt bars can be directly inserted into slots defined on the vehicle itself. In this example, manufacturers will design compartments that can accept one or more volt bars, thus eliminating the need for an auxiliary batter carrier. The compartments can be on the side of a vehicle with or without a door, in the trunk, in the passenger compartment, etc. So long as volt bars can be accepted into a receptacle and the volt bar(s) can provide charge to the vehicle or axillary charge to the main battery, the placement of the volt bar(s) is, in one embodiment, a design configuration.

[00150] In one embodiment, the volt bars utilized in the auxiliary battery carrier can be replaced with fresh batteries purchased while the user of the electric vehicle is on a trip or a distance from the user's home base. For instance, volt bars can be sold utilizing a kiosk system. The kiosk system would, in one embodiment, store available volt bars that can be purchased by drivers of electric vehicles while away from their home base. For example, the kiosk system will provide one or a plurality of receptacles for receiving volt bars that are depleted in charge, and dispense charged volt bars to users desiring to extend the range of their trip. The kiosk, in one embodiment, will be coupled to a power source that can then recharge the volt bars and make them available to other users that trade in their charge de-pleaded volt bars.

[00151] If the user wishes to purchase volt bar without first returning a charged the depleted volt bar, the user can be charged a separate fee that is higher than if the user had returned a depleted volt bar. The kiosk system would preferably be connected to the Internet so that users of electric vehicles could access an application that would identify locations of kiosk systems with available volt bars. In one embodiment, the

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application would include software that communicates with an application sitting in a central hub that manages all of the kiosk systems deployed in the field. The kiosk systems will also report the status of available volt bars, volt bars returned and in charging mode, available charging slots, inventory of volt bars, discounts available at particular kiosk systems, and potential damage to volt bars that have been returned. By compiling this information, the kiosk system can interface with the central hub, which provides information to users accessing an Internet application (mobile application), so that users can locate the closest kiosk system or the closest kiosk system having discounts.

[00152] In one embodiment, the discounts provided by the specific kiosk systems can be programmed based on the desire to sell more volt bars at certain kiosk systems with excess inventory, or to encourage virtual routing of volt bars throughout geographic regions. For example, if trends are detected by software operating on the central hub that volt bars are migrating from East to West, a depleted inventory may be found in the East. To encourage load balancing of inventory, discounts can be provided in the West, which would then cause migration of volt bars toward the east. In one embodiment, each of the kiosk systems would be enabled with software that communicates with the central hub, and the software would be utilized to provide the most efficient information regarding inventory, and operational statistics of each kiosk system deployed throughout a geographic region (e.g., geo-location)

[00153] In another embodiment, each kiosk system may be configured with an interface that receives payment data from the users. Example payment receipts may include credit card swiping interfaces, touchscreens for facilitating Internet payment options (PayPal), coupon verification, and communication of deals with friends through a social networking application. These applications can be facilitated by software operating at the kiosk station, or by software executing on the users mobile device, or a combination of both. In still another embodiment, each of the volt bars that are installed in the various kiosk stations will be tracked using tracking identifiers. In one embodiment, without limitation, the tracking can be facilitated using RFID tags. The RFID tags can be tracked as users purchase, return, and charge the depleted volt bars at the various kiosk stations.

[00154] Additionally, the volt bars will include memory for storing information regarding number of charges, the health of the battery cells, the current charging levels, and other information. Additionally, the volt bars can store information regarding the various kiosk stations that the volt bars have been previously been installed in, or received from. All of this information can be obtained by the software running at the kiosk station, and communicated to the central hub. The central hub can therefore use this information to monitor the health of the various volt bars and can inject new volt bars into the system at various locations when it is detected that the inventory is reaching its end of life.

[00155] In still another embodiment, the central hub can direct maintenance vehicles to remove damaged volt bars from kiosks, or insert new volt bars at certain kiosk locations. Because the central hub will know the frequency of volt bar utilization at each of the kiosk locations, the central hub can dispatch maintenance vehicles and personnel to the most optimal location in the network of kiosk stations.

[00156] In another embodiment, a system for providing auxiliary charge to a main battery of an electric vehicles is provided. The system includes an auxiliary battery for holding a plurality of charge units, the auxiliary battery being connectable to the main battery of the electric vehicle, the plurality of charge units being rechargeable and being replaceable from within the auxiliary battery, such that replacing particular ones of the plurality of charge units with charge units with more charge increases a total charge of the auxiliary battery. Also provided is a kiosk for storing a plurality of charge units, the kiosk having, (i) slots for storing and recharging the plurality of charge units; (ii) control systems for communicating over a network, the control system includes logic for identifying inventory of charging units in the kiosk and logic for processing payments and fee adjustments for charge units provided or received in the slots of the kiosk. The system also includes a display for providing an interface for enabling transactions to provide or receive charge units to customers. The system further provides a central processing center that communicates with, (i) a plurality of said kiosk over a network, the central processing center configured to provide for centralized rate changes to prices to charge for the charge units at each of the plurality of kiosks, wherein changing the price of the charge units is specific to each of the kiosks and is based on a plurality of metrics, including availability at each kiosk and discounts, and (ii) a plurality of vehicles, the plurality of vehicles being provided with access to availability information of charge units at each of said kiosks, the availability information being custom provided to the plurality of vehicles based on geo-location.

[00157] Another embodiment is for a method for providing charge options to drivers of electric vehicles. The method includes receiving data concerning charge providing availability from charge locations, receiving a request from processing logic of an electric vehicle, the request identifying a desire to obtain charge, and determining a current location of the electric vehicle. The method further includes determining identification of charge locations in proximity to the electric vehicle and determining any sponsored rewards offered by the charge locations. The method communicates to the electric vehicle a path to one of the charge locations, the path identifying a sponsored reward offered at the charge location for the path.

[00158] Yet another embodiment, a computer processed method for providing charge options to drivers of electric vehicles is provided. The electric vehicles have wireless access to a computer network. The method includes receiving data concerning charge providing availability from charge locations and receiving data concerning sponsored rewards offered by the charge locations and rules for offering the sponsored rewards. The method receives a request from processing logic of an electric vehicle, and the request identifies a desire to obtain charge in route between a current location of the vehicle and a destination location. The method includes generating a plurality of paths that can be traversed by the electric vehicle between the current location and the destination location, where each of the paths identify possible charge locations at which the electric vehicle can be charged. Each of the possible charge locations identifying any sponsored rewards offered if the electric vehicle obtains charge at the possible charge locations. The method includes forwarding the plurality of paths as options to the user of the electric vehicle via a user interface. The sponsored rewards are identified to the user to enable tradeoffs between length of path and reward obtained.

[00159] Methods and systems for providing charge options to drivers of electric vehicles are provided. One example method includes receiving data concerning charge providing availability from charge locations and receiving a request from processing logic of an electric vehicle, the request identifying a desire to obtain charge. The method includes determining a current location of the electric vehicle and determining identification of charge locations in proximity to the electric vehicle. The method further includes determining any sponsored rewards offered by the charge locations and communicating to the electric vehicle a path to one of the charge locations, where the path is identified with a sponsored reward offered at the charge location if the path is selected and charge is obtained. The method can be processed by a server and paths are communicated to vehicles to alert drivers of the electric vehicles of rewards or discounts if charge is obtained from certain locations. Other embodiments that compliment sponsored paths for obtaining charge are described below, and relate to electric vehicle charging and reduction of range anxiety.

[00160] Embodiments are also described for methods and systems for providing auxiliary charging mechanisms that can be integrated or coupled to a vehicle, to supplement the main battery of a vehicle. The auxiliary charging mechanism can be in the form of an auxiliary battery compartment that can receive a plurality of charged batteries. The auxiliary battery compartment can be charged with or without the vehicle, and can be installed or placed in the vehicle to provide supplemental charge to the vehicles main battery. Thus, if the main battery becomes depleted, the auxiliary battery compartment, having a plurality of charged batteries, can resume providing charge to the vehicle.

[00161] In other embodiments, the auxiliary battery can be one compartment that has multiple smaller compartments for receiving volt bars (charging units), or other battery type charging devices. Further, the auxiliary battery is shown interconnected to the main battery of the vehicle, or to a battery distribution or charge distribution-handling unit. In other embodiments, the auxiliary battery can be inserted into side panels of the vehicle, in the front compartment of the vehicle, the floorboard of the vehicle, the site support structure of the vehicle, etc.

[00162] Cloud processing technology is also provided, which provides processing resources to connected vehicles through a distributed network. In one embodiment, the cloud processing can communicate with various charging stations using Internet connections, where charge Station metrics can be uploaded to the cloud processing system. The charge Station metrics can include availability of charge pumps, charge handles, charge plugs, charge mats (for wireless chagrining), volt bars, or other charge providing facilities.

[00163] Examples of such metrics can include the number of charge pumps available at particular period of time, historical availability times of the charge pumps, typical charge time estimates at particular charging stations, prices associated with the charge at the particular charging stations, feedback from customers through social networks, concerning the charging stations, and the like. The cloud processing can then process the charge Station status, traffic information associated with locations around or between charging stations and a user's current location, and provide specific suggested routes. The route generator can provide guided routes to the various charging stations (e.g., charge locations), based on the users immediate needs, desire for discounts, sponsored rewards, or the amount of time it will take to obtain access to a charge pump at a particular point in time. Broadly speaking, a discount is a reward and a reward is a discount, and a sponsored reward is a discount that is at least partially paid by another party for a the benefit of the recipient of the reward.

[00164] The driver location processor can communicate the information concerning drivers to the cloud processing logic, so as to provide the most effective information concerning charge availability to the various drivers. For example, users in their particular vehicles may have a connected display or a portable device having access to the Internet. Based on the users location and charging needs, (and optionally the destination) the user can be provided with route options (e.g., one or more optional paths). The route options can be, for example, the fastest and most available charge Station (or charge providing devices) to the users current location, the cheapest charge available at a particular point in time, or information regarding charge prices for a particular future point in time.

[00165] Once the user selects a route option, the route generator can provide information concerning the charging station, and can also prepay or book a charging station slot. A charging station slot can include, for example a parking spot in front of a charging station. The charging station slot can be reserved if the user decides to prepay for the charging station, as a convenience. For example, if charging slots at a particular charge Station appear to be heavily used, a user can pre-reserve a charging slots ahead of time, so that when the user arrives at the charging station, the charging slot will be immediately available. This could be considered a convenience fee associated with pre-reserving of a charging slot, along a particular route. In another embodiment, the charging station can provide incentives to users to come to the particular charging station.

[00166] For example, if the user prepays for charge at a particular charging station, the charging station can provide a discount on the charge provided. For example, if the charging station wishes to fill a plurality a charging slots during a particular slow time, the charging station can communicate with the cloud processing and publish availability of its charging stations per particular period of time. A database associated with cloud processing will hold this information so it can be dynamically updated and accessed in real-time by users to fill their charging needs of their electric vehicles. During that particular period of time, the charging station can offer discounts or rewards to users so that drivers can decide to visit the charging station instead of another charging station. Still further, charging stations can offer discounts for users to use the particular charging station, and the discounts can be offered by more than one party or entity. For instance, if the charging stations are located near a particular business, that particular business can sponsor discounts or rewards at the charging station to drive traffic to or near that particular business. When users are charging their vehicles at the particular station near the particular business, users can spend their time at the particular business while their vehicle is being charged.

[00167] Potentially, the owners of the particular business that sponsored the discounts can increase traffic to their business and increase sales. In another embodiment, the owners of the particular business can offer discounts to their business products or services, if the business products or services or located near or beside the charging station. As will be described below, other embodiments can include having charging station pumps or handles or plugs, located in nontraditional charging station configurations. For example, charging plugs can be installed at various nontraditional locations, such as parking lots of retail stores. Other examples locations can include, without limitation, parks, city streets, parking garages, post offices, government areas, schools, offices complexes or campuses, coffee shops, malls, strip malls, box store parking lots, beach parking, homes, public roads, etc. If a large retail store has a large parking lot, a portion of that parking lot can be dedicated for charging plugs, which can be used by customers while the customers shop at the retail location. In such a situation, the owners of the retail store that have charging plugs assigned to particular parking spots, can publish availability of those charging plugs through the cloud processing network.

[00168] The cloud-processing network can then publish availability and prices for users that may be driving around, or may be passing by the retail store along a particular path or route. In some embodiments, the retail store can offer significant discounts for charge, if users charge their vehicles at the charging plugs of the retail store. While the users charge their vehicles, the users may visit the retail store and purchase goods or services, which is a reward for the retailer that is offering the discount for the charge. In still another embodiment, retail stores having charge plugs can advertise availability of the charge plugs (and parking spots) in real time, and provide discounts or deals to users that may wish to charge at the particular retail location.

[00169] The discounts can be for the goods and services of the retail store, or simple discounts on the charge provided by the charge plugs of the retail store. As noted above, one embodiment would allow the parking spots having the charge plugs to be reserved and advance, to provide additional convenience to users. In such a configuration, the parking spots can include mechanical barriers that lift and close to allow vehicles to come into and leave the particular parking spots. Thus if a parking spot is reserved, the mechanical barrier can remain closed until the vehicle having the code can communicate access to lift the mechanical barrier so that charging can commence immediately upon arriving at the reserved parking spot. In another embodiment, the charging station or plug can include a monitor or display that indicates whether or not the charging plug is reserved.

[00170] If the charging plug is reserved, no other user can park in front of the parking spot, or else received a ticket or fine for parking in a parking spot that's been reserved. The parking spot reservation for charge can be made in advance; such as while user is driving around smart phone, or an integrated device of the vehicle that has access to the Internet makes looking for charge and the reservation. The transaction can also allow a user that is searching for charge to prepay for the charge using a graphical user interface or other exchange mechanism, associated with the route and reservation of a particular charge station or slot. In some embodiments, the charge stations or plugs can be placed in shared parking lots or locations where multiple retail outlets reside.

[00171] In such a case, multiple retailers can provide discounts to users to come and use the charging stations located at the retailer's locations. These discounts can then be published to the cloud processing logic. These discounts can also be published dynamically at the request of the provider of the charge, using an Internet portal that allows the user to participate in a network of charge stations that provide discounts. In such embodiments, the discounts can be provided by multiple retailers for their goods and services, and the plug can be located in the shared parking lot. Having this information, the cloud processing can communicate with a route generator to generate various routes (e.g., paths) that are optimized to the user's desired outcome.

[00172] The optimization can be to route a user for charge along a plurality of charge stations or plugs that provide discounts. If this is the goal of the user, the route may be longer than other routes, but the discounts may be greater. Such routes may be viewed as a sponsored path that requires a user to traverse a particular route in order to obtain charge for their vehicle. The sponsored routes can change dynamically over time, as sponsors decide to add or remove discounts. Thus, a user that finds a good path may wish to buy now, to avoid losing the discount. If a particular charge station or chart plug has a lot of customers during a particular period to time, the discounts may drop dynamically. If the charge plug for station experiences low activity, the discounts may be increased dynamically. The dynamic adjustment of discounts can occur based on a preset number of rules (e.g., what discount, where offered, when offered, how long it lasts, incentives for fast buy, logic for combining discounts, logic for sharing costs of discounts with others, logic for reducing the cost of the charge, etc.), as set by the provider the charge and/or the sponsor.

[00173] The cost for the charge can also be provided with a green rating, which signifies how efficient the charge station is in supplying charge, and the location and source of the charge provided by the charging station. If the charging station obtains charge from wind power, the green rating would be high. If the charge station receives its charge from fossil fuels, the green rating may be lower. If the charging station receives is charge from a variety of different sources, whether solar, wind, or fossil fuel, the green rating can be adjusted. This metric information can then be provided to the cloud processing to allow users of electric vehicles to decide whether or not to visit a particular charge station or charge plug.

[00174] In some embodiments, the price of the charge may be more expensive if the green rating is very high, but the charge value to the user may be high, if the user wishes to obtain a very high green rating, and a lower carbon footprint.

[00175] For example if the user wishes to replace the vehicle, the user can simply click a button, select an icon, touch a screen, speak a command, gesture an input, etc., to figure out what his vehicle value is, the cost of a replacement vehicle, and the total cost after exchange. This information can be useful to the user in deciding whether or not to trade in the vehicle or remain with the current vehicle and make investments in repairs. As shown, the data exchange between vehicles and the vehicles and the cloud processing can be extensive, but such information can be made available to drivers of those vehicles to make informed decisions.

[00176] The drivers can also be provided with information of the duration of the discount, so that drivers can obtain the discount if they have the time to traversed the path, or avoid the path if the discount will not be present when the driver arrives at that application. In another embodiment, the logic in the vehicle or the processing system in the cloud processing can determine whether or not the user would be able to arrive at each of the charging stations or plugs to receive the sponsor discounts. This analysis can include, for example, reviewing traffic patterns, travel speeds and estimates to traversed the different distances, time of day, etc.

[00177] In some embodiments, the discounts are provided by a combination of the charge station and retail shops nearby. In other embodiments, the retail shops and plugs/charge providers can provide combined packages of discounts, which could drive users to their location. Accordingly, it should be understood that the dynamic generation of paths could be sponsored, such that the user can be provided with identification of charging locations along a particular path, and the discounts that may be provided along those particular paths.

[00178] Again, the information displayed to the user can be displayed in the vehicle's display screen or can be displayed on the users display device (e.g. smart phone, computer, tablet, etc.).

[00179] Broadly speaking and without limitation, obtaining charge will include plugging the vehicle into a charging receptacle so as to charge the native battery of the vehicle. In another embodiment, obtaining charge can also include refilling on volt bars to replenish volt bars that have been used during the vehicle usage. In other embodiments, charge can be transferred to a vehicle wirelessly (e.g., without plugging in an outlet or receptacle). Examples can include a transfer surface that the vehicle parts over, and the charge can be transferred wirelessly to the vehicle via conductors on the underside of the vehicle. The vehicle can simply part in the slot and once payment is made, the charge can start to flow capacitively or wirelessly to the electric vehicle.

[00180] As can be appreciated, the sponsored path process can provide a quick and efficient manner for allowing the user to identify their desired endpoint, and provide options for traversing a path to that and point. Along that endpoint, the user can be provided with discounts for charge by sponsors, which can influence or drive people to their charging outlets. The discounts can also be provided in a hybrid manner, such as providing discounts for the charge and discounts with in the retail outlets that are located proximate to the charging stations.

[00181] Providing this information to drivers in real time is efficient for both drivers and the retail locations. Drivers in their electric vehicles will need charge, and providers of the charge will benefit from driving users to their location. If the user is still progressing along their desired path, the providers of the discount are simply providing a service and driving customers to their location, where the drivers may purchase other goods and services while the vehicle is being charged.

[00182] In one embodiment, the sponsored paths may be generated on electronics and circuitry of the vehicle, or by processing in the cloud processing system (e.g. networked Internet systems). In some embodiments, the sponsor paths may be processed partially on the vehicle and partially on the cloud processing system. In some embodiments, the sponsored paths would be dynamically generated on the cloud processing system, and the vehicle or smart phone of the user would simply connect to the cloud processing system.

[00183] The data exchange can therefore be dynamically set to be real time, such that providers of the discounts, providers of the charge, and drivers of the vehicles can exchange information. In this example, the provided to the charge can provide discount information, incentives, etc., and the drivers of the vehicles can provide information concerning their desired paths. The processing system can then generate a plurality of options for the user to traverse from point A to point B. For example, the user can select to traverse a sponsored path, to a particular address. The display the vehicle can then requested the user identify whether or not a sponsored path is desired.

[00184] It will be obvious, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention.

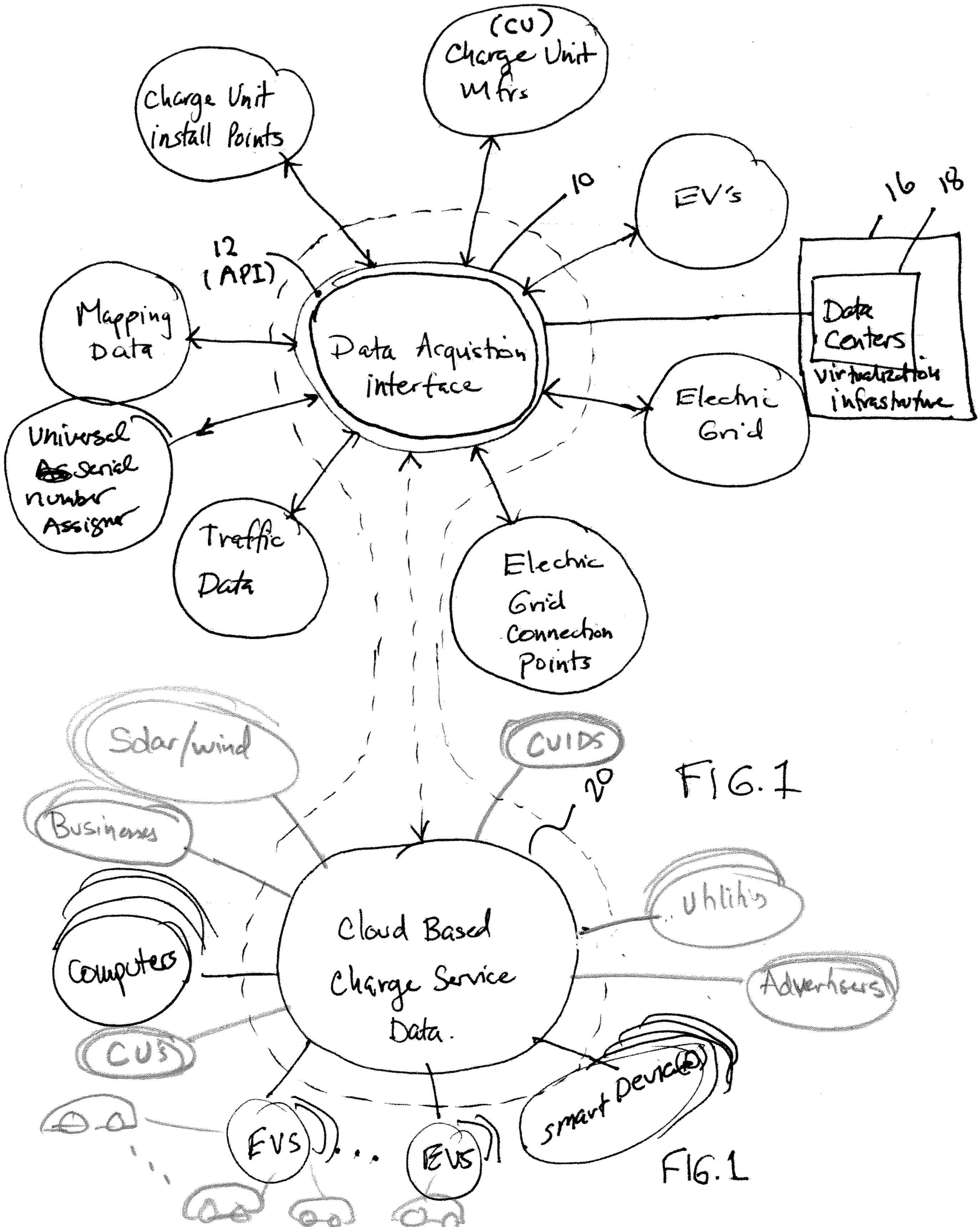
[00185] Embodiments of the present invention may be practiced with various computer system configurations including hand-held devices, microprocessor systems, microprocessor-based or programmable consumer electronics, minicomputers, mainframe computers and the like. The invention can also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a wire-based or wireless network.

[00186] With the above embodiments in mind, it should be understood that the invention could employ various computer-implemented operations involving data stored in computer systems. These operations are those requiring physical manipulation of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared and otherwise manipulated.

[00187] Any of the operations described herein that form part of the invention are useful machine operations. The invention also relates to a device or an apparatus for performing these operations. The apparatus can be specially constructed for the required purpose, or the apparatus can be a general-purpose computer selectively activated or configured by a computer program stored in the computer. In particular, various general-purpose machines can be used with computer programs written in accordance with the teachings herein, or it may be more convenient to construct a more specialized apparatus to perform the required operations.

[00188] The invention can also be embodied as computer readable code on a computer readable medium. The computer readable medium is any data storage device that can store data, which can thereafter be read by a computer system. The computer readable medium can also be distributed over a network-coupled computer system so that the computer readable code is stored and executed in a distributed fashion.

[00189] Although the foregoing invention has been described in some detail for purposes of clarity of understanding, it will be apparent that certain changes and modifications can be practiced within the scope of the appended claims. Accordingly, the present embodiments are to be considered as illustrative and not restrictive, and the invention is not to be limited to the details given herein, but may be modified within the scope and equivalents of the description.



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Mfrs
Charge Unit
install Points
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EV's
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18
12
(API)
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Data Acquistion
interface
Data
Centers
virtualization
infrastructure
Electric
Grid
Universal
serial
number
Assigner
Traffic
Data
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Connection
Points
Solar/wind
CUIDS
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CUs
smart Device(s)
EVs
EVs

FIG. 1

FIG. 1

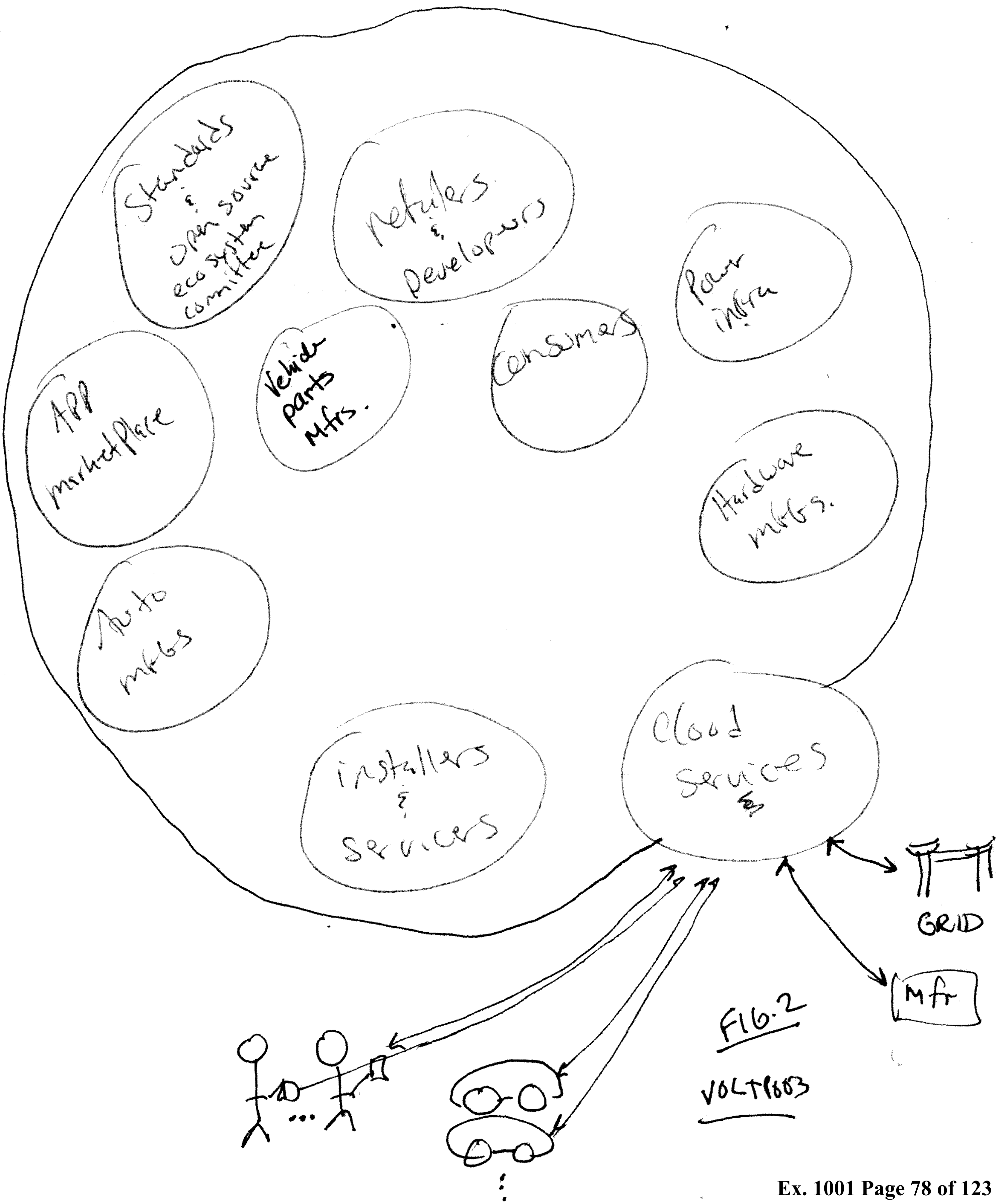


FIG. 2

VOLT1003

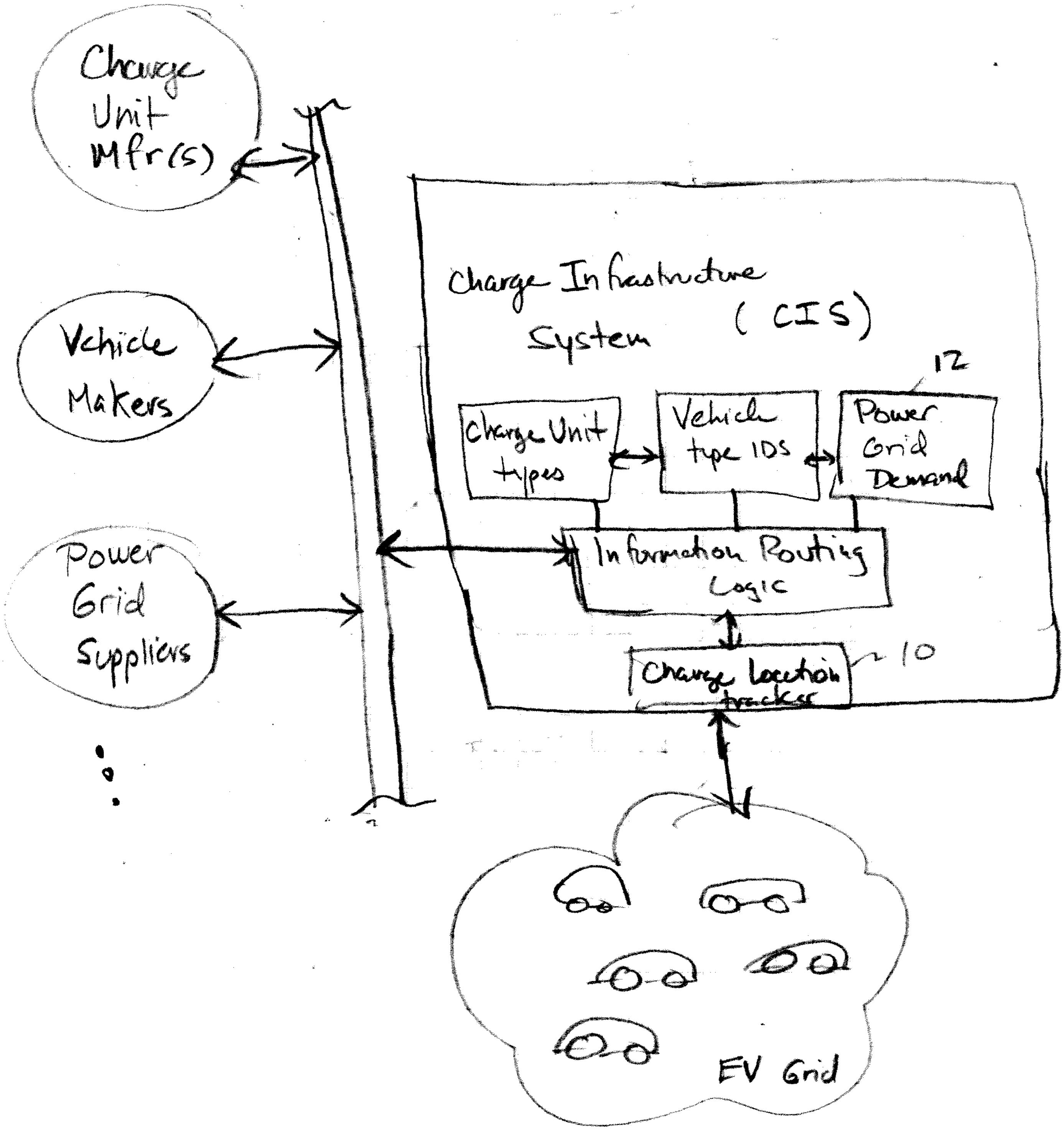


FIG.3

VOLTP003

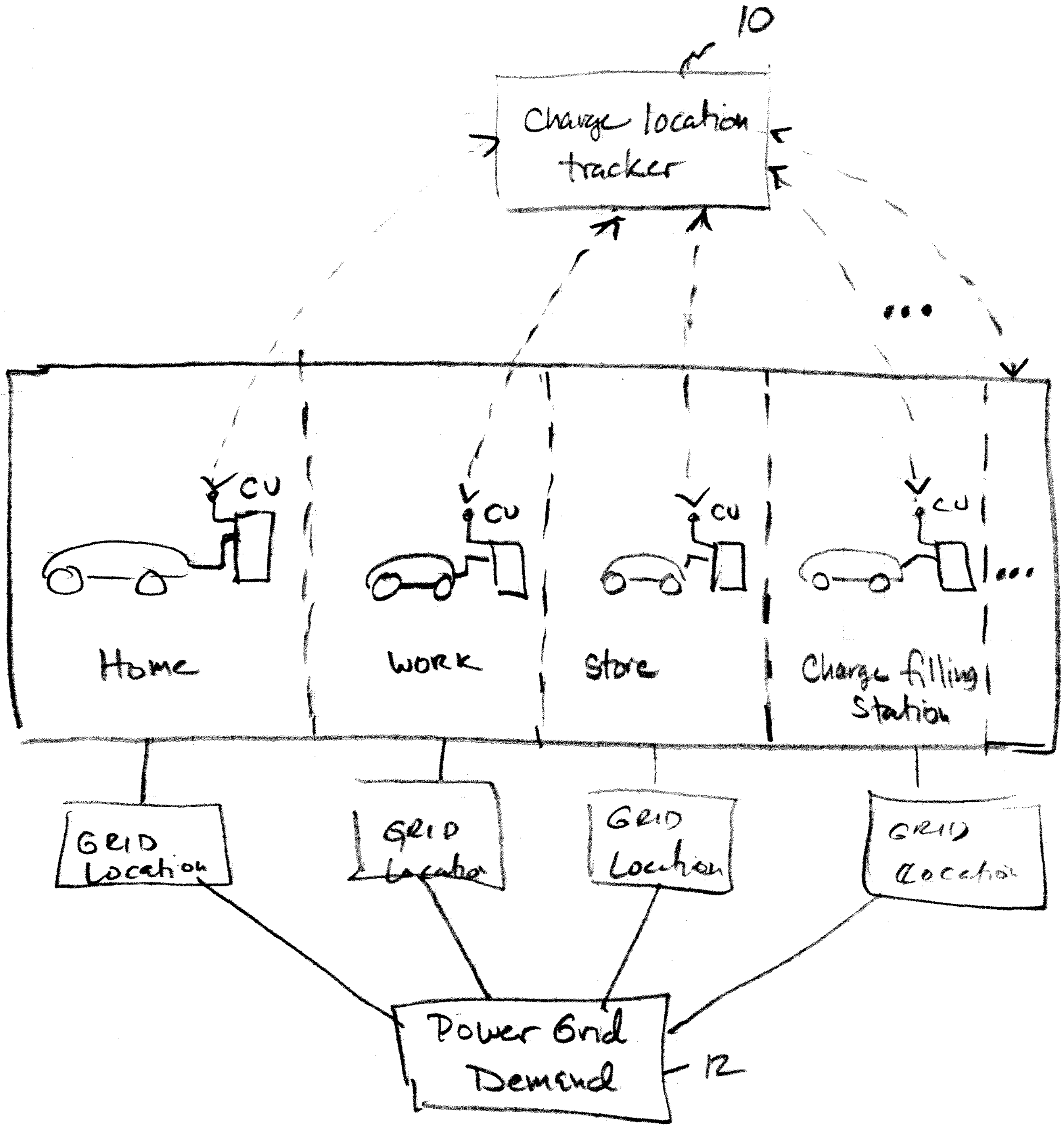


FIG. 1

VOLTP004

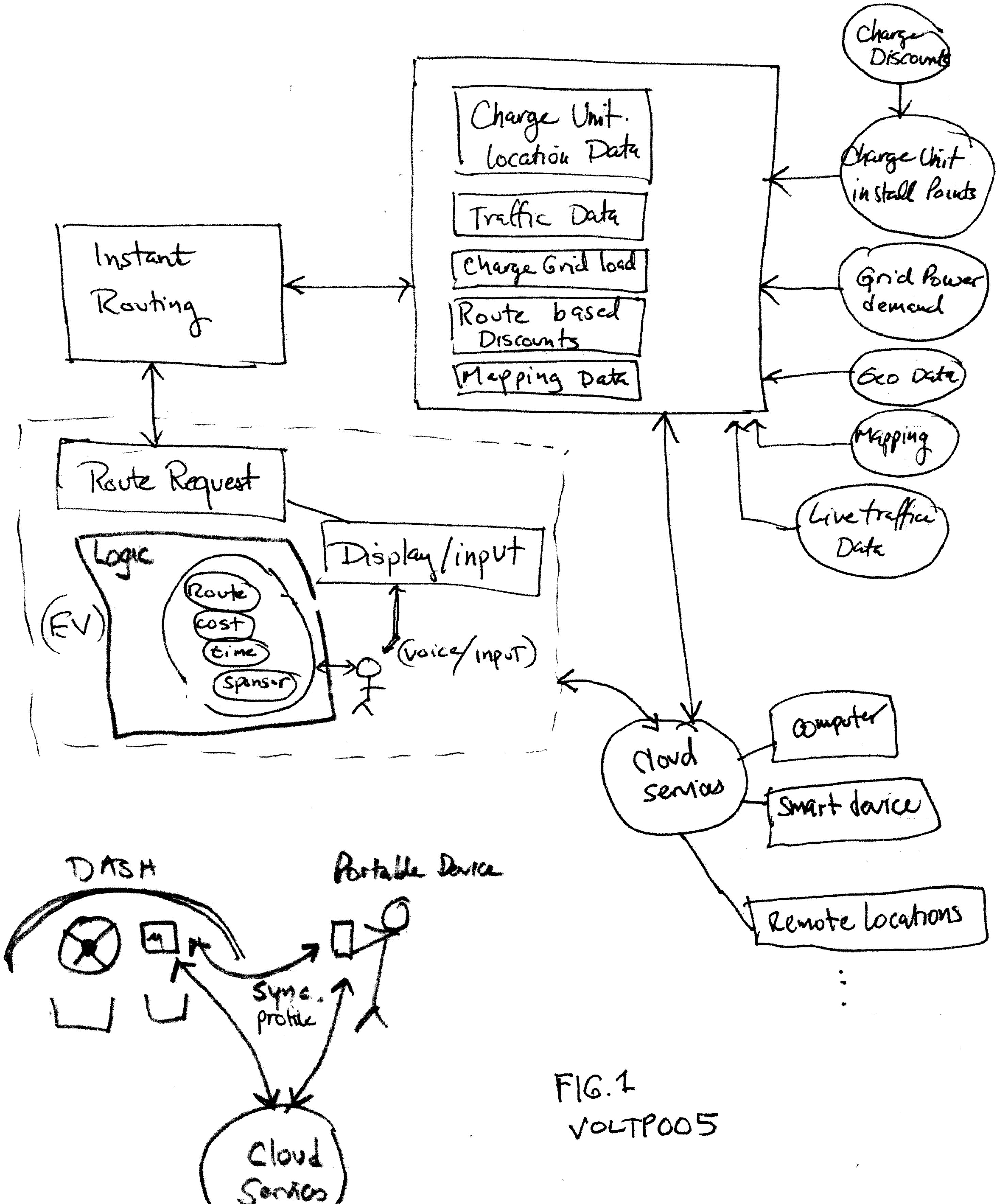
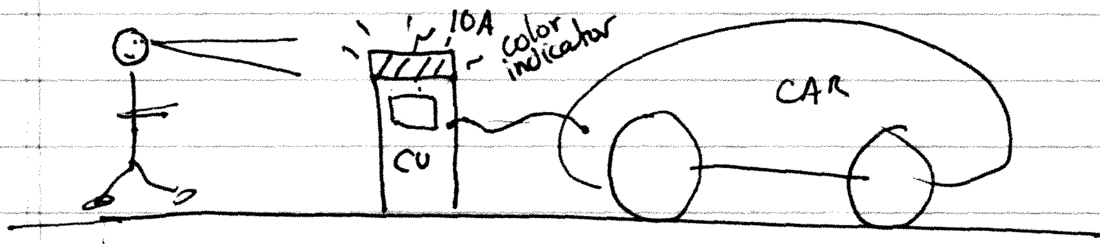


FIG. 1
VOLTP005

Yellow 10A	Orange 10B	Light Red 10C	Red 10D	Green 10E
<20% Full	~50% Full	~90% Full	No Service or FULL	Available



Visual ID of charge level on car

FIG. 1

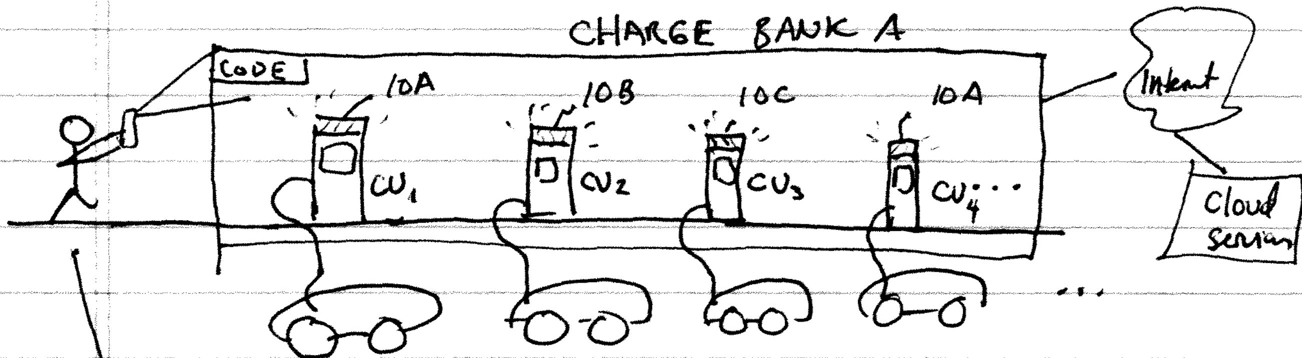


FIG. 2

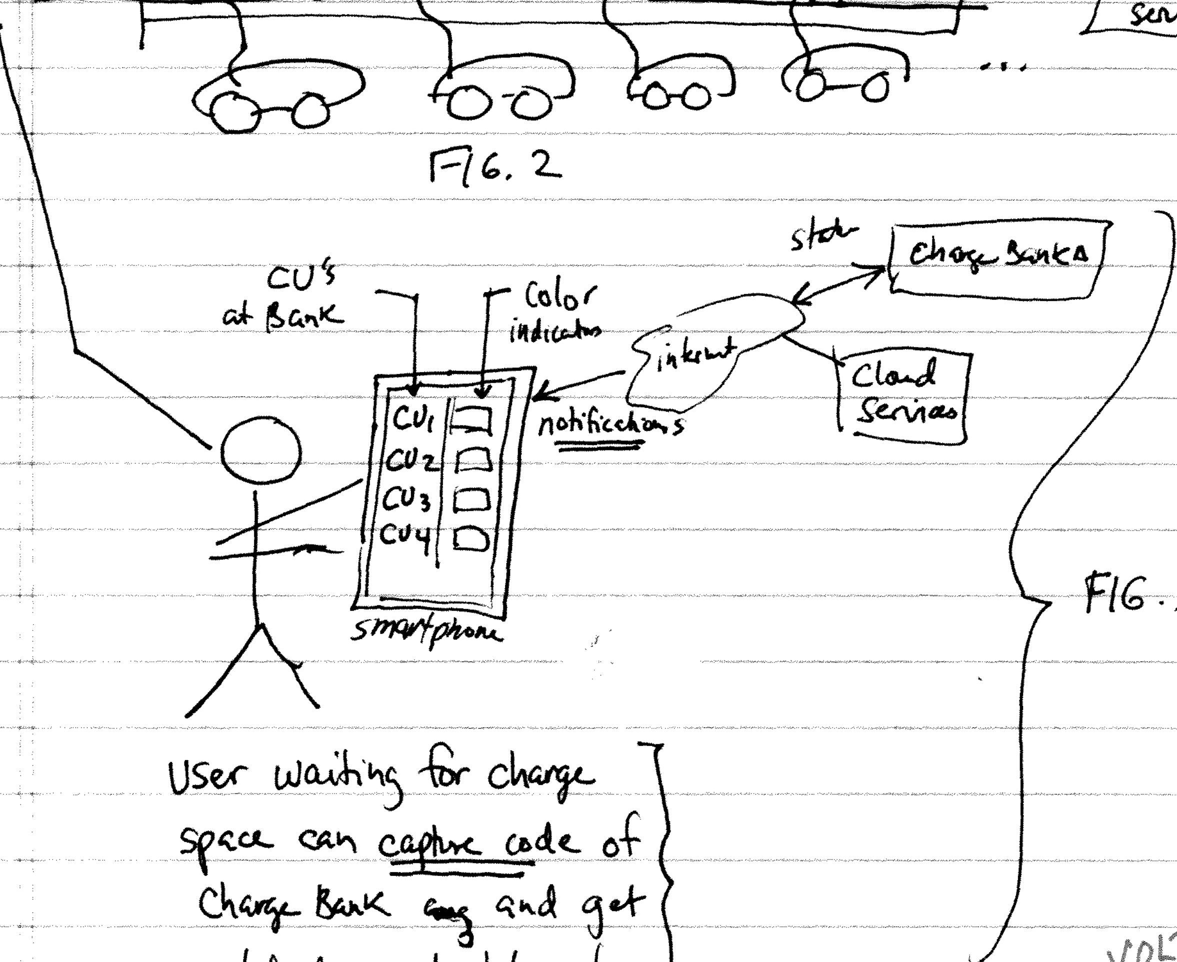


FIG. 3

User waiting for charge space can capture code of Charge Bank and get notifications of status of all CU's at Charge Bank.

VOLTP006

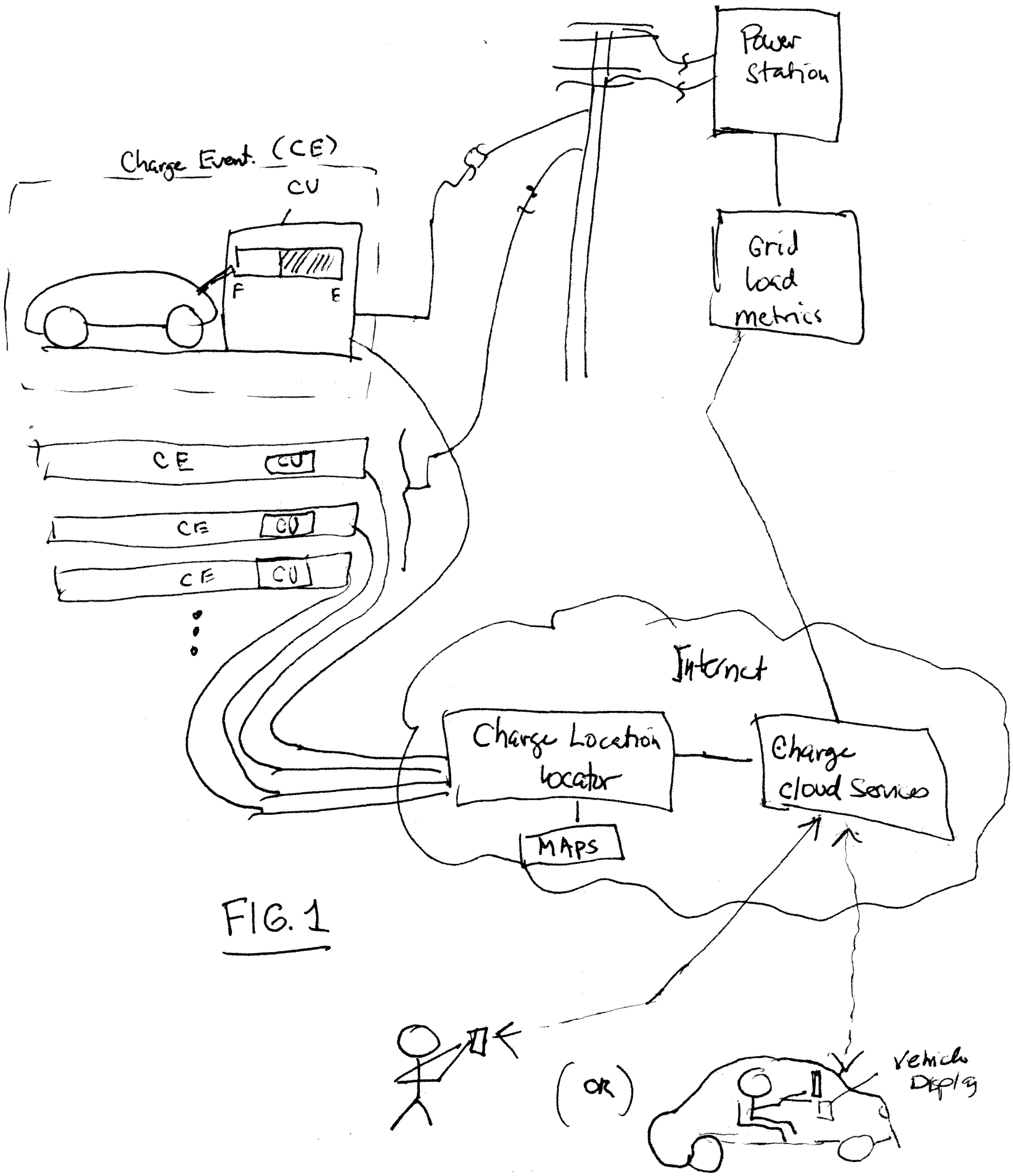


FIG. 1

VOLTP007

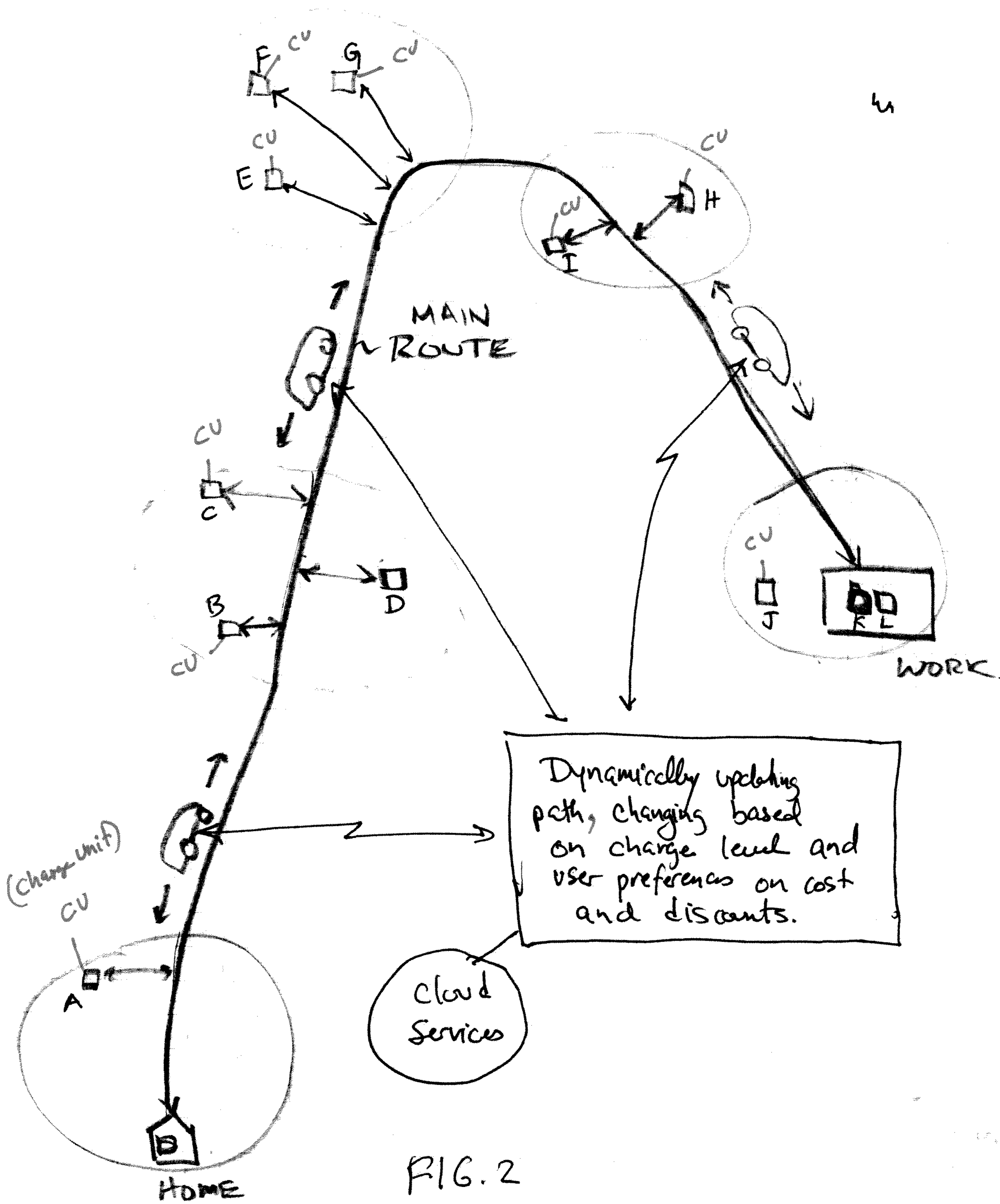


FIG. 2

VOLTP007

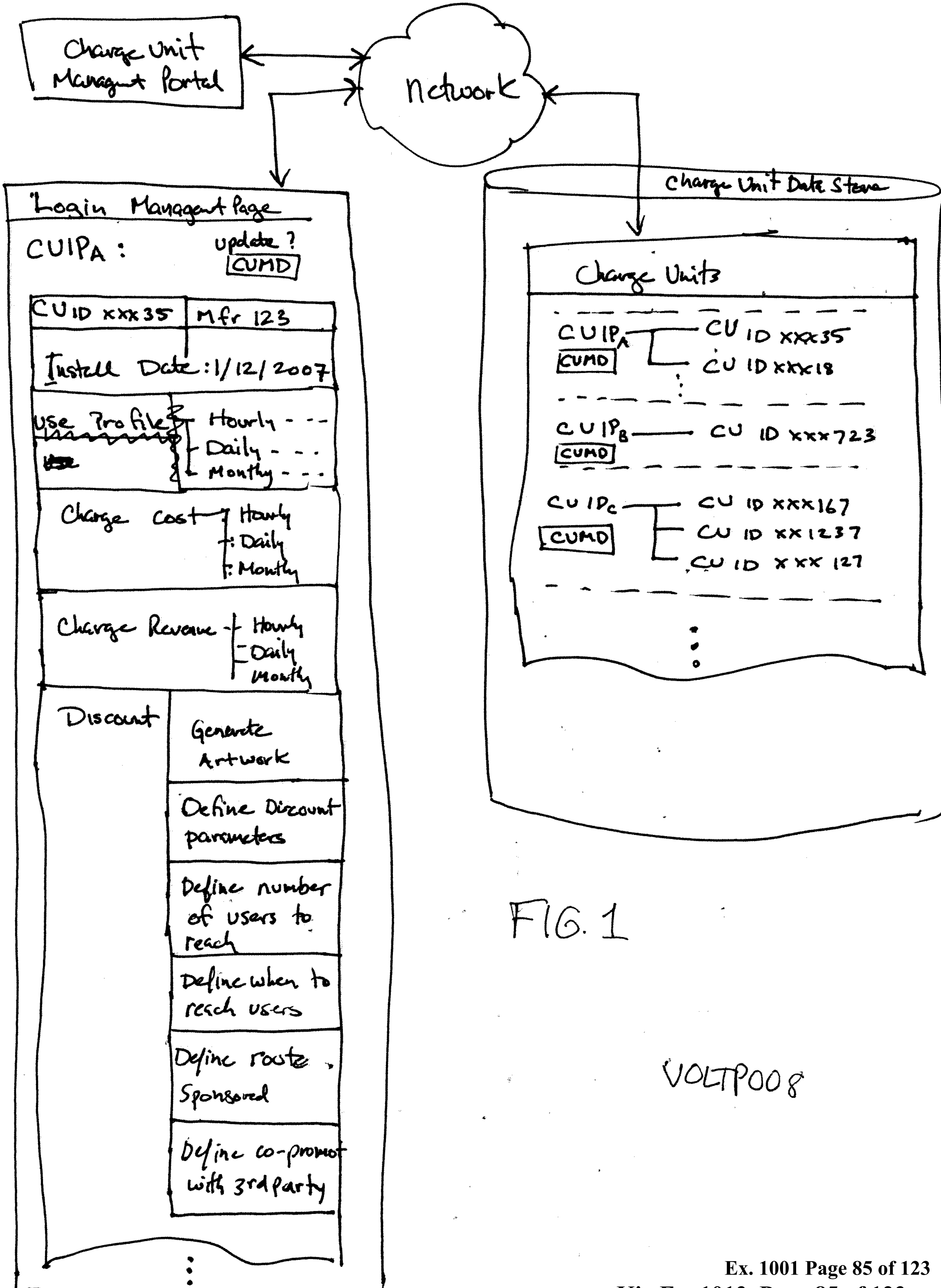


FIG. 1

VOLTP008

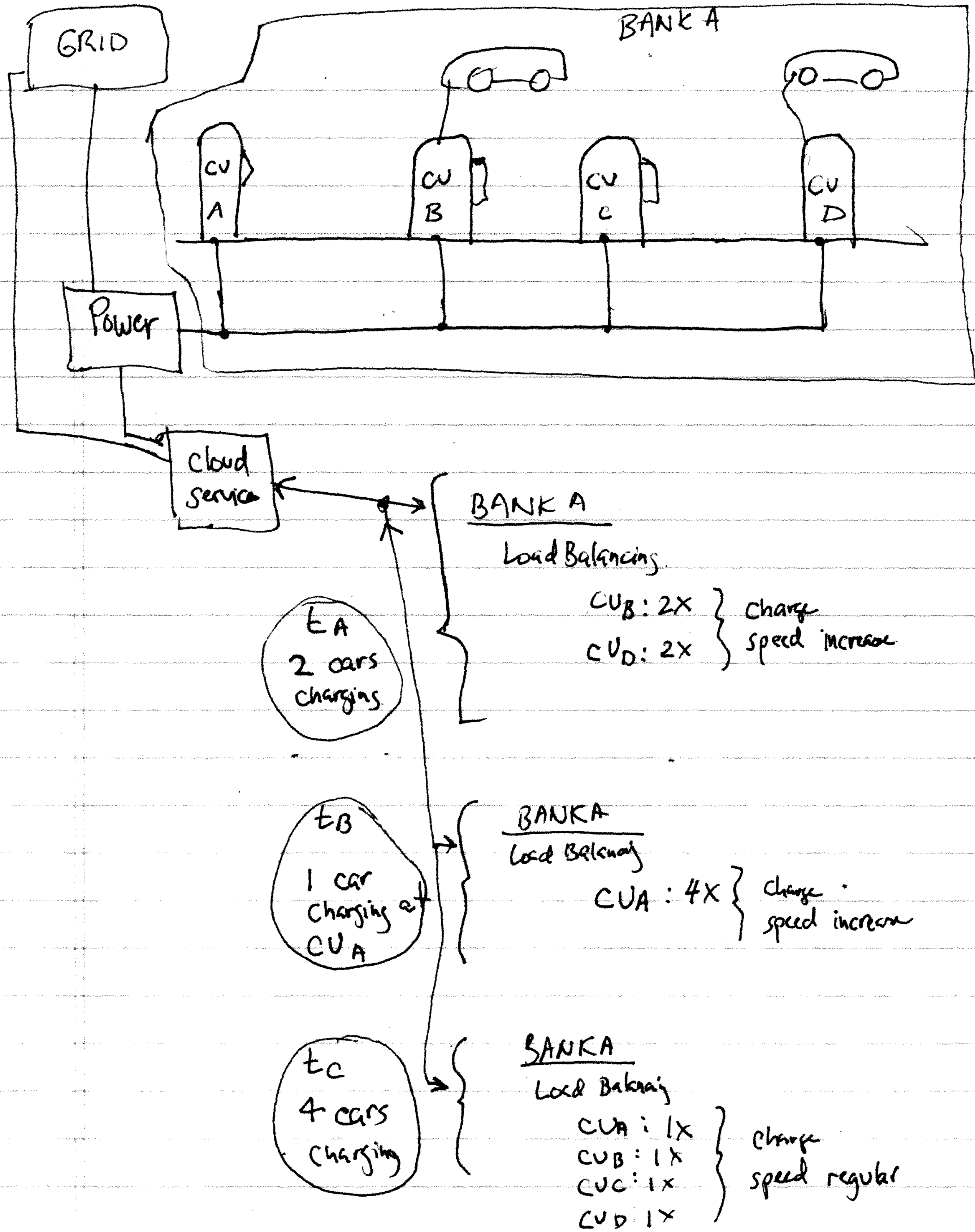

GRID
BANK A
CU A
CU B
CU C
CU D
Power
Cloud Service
BANK A
Load Balancing
CUB: 2X
CUD: 2X
charge speed increase
tA
2 cars charging
tB
1 car charging at CUA
BANKA
Load Balancing
CUA: 4X
charge speed increase
tC
4 cars charging
BANKA
Load Balancing
CUA: 1X
CUB: 1X
CUC: 1X
CUD 1X
charge speed regular

FIG. 1

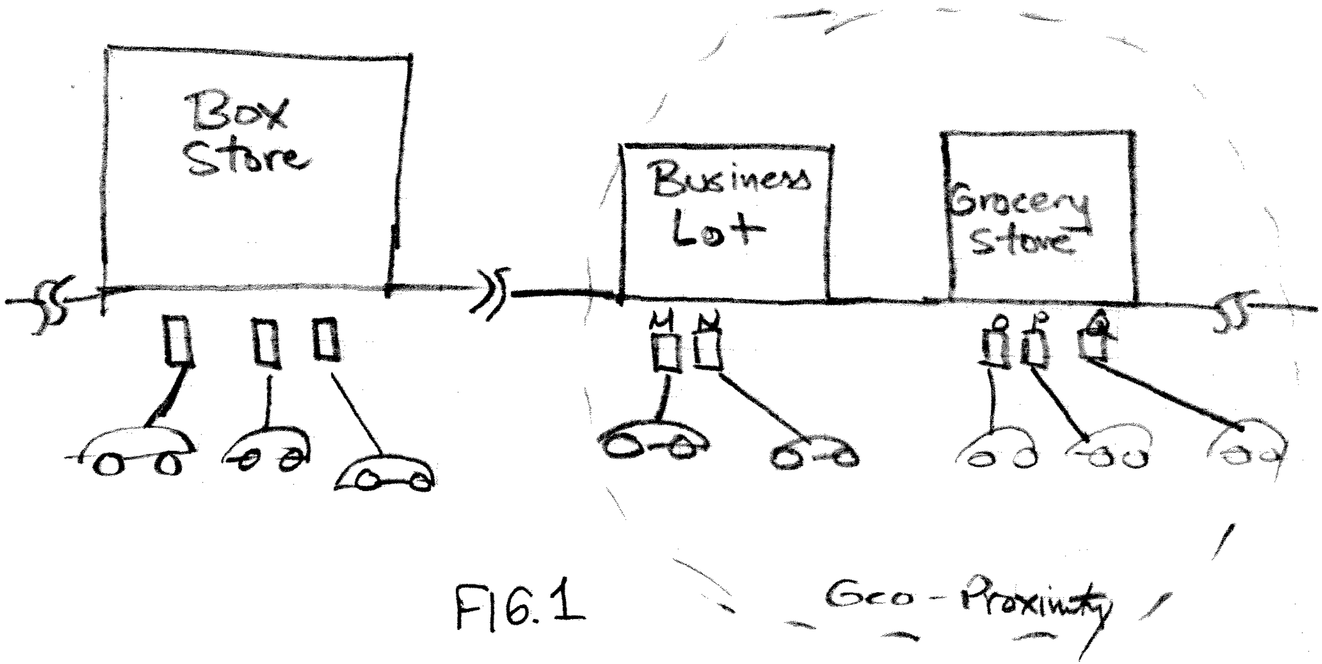


FIG. 1

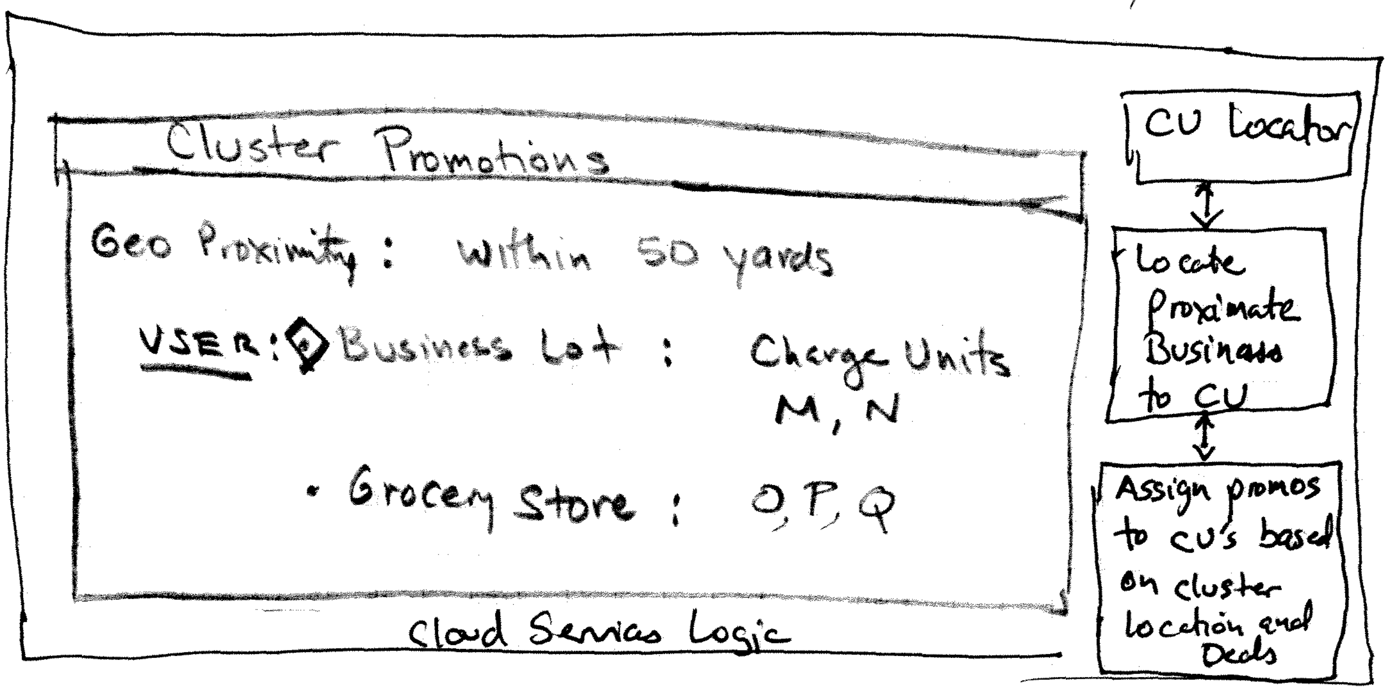


FIG. 2

VOLTP010

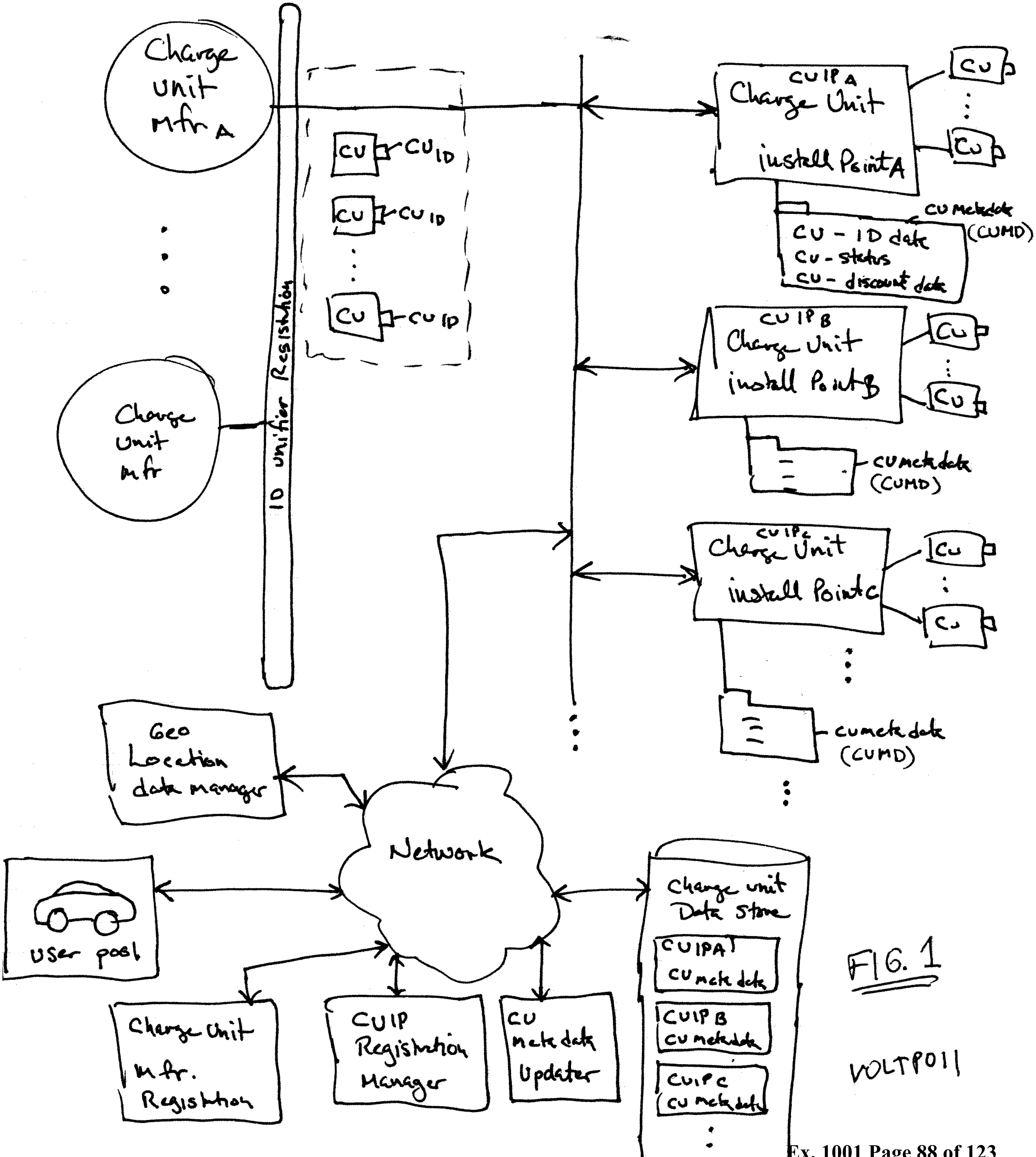


FIG. 1

VOLTP011

(A) (B) (C) Color Blinking Indicating Location of available Charge Unit (CU).

FIG. 1

- Color Blinker can be located on top of pole next to charge Unit to allow user to locate spot.
- The location can be also identified visually at night and color can indicate availability.

VOLTP012

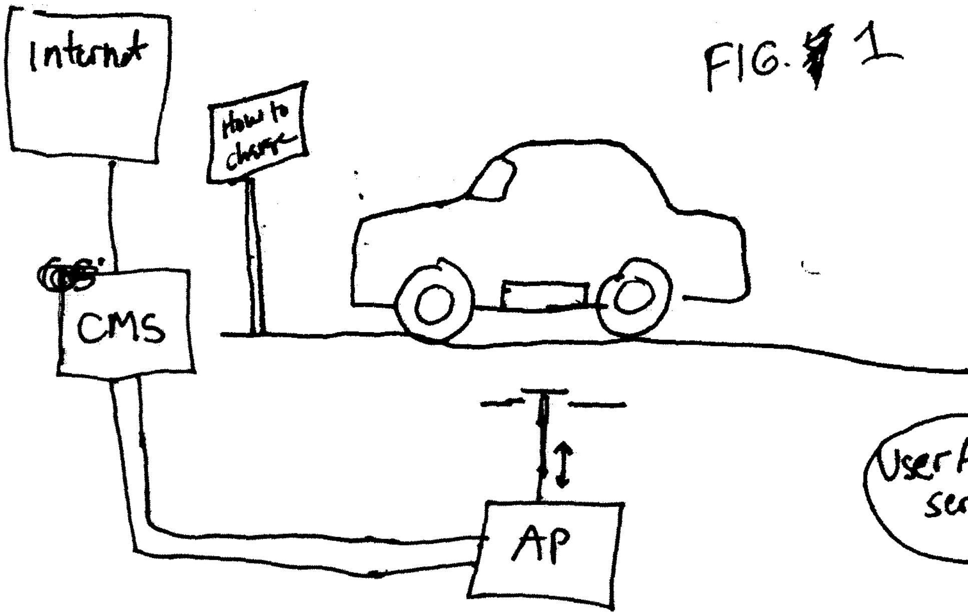


FIG. 1

FIG. 2

VOLTP013

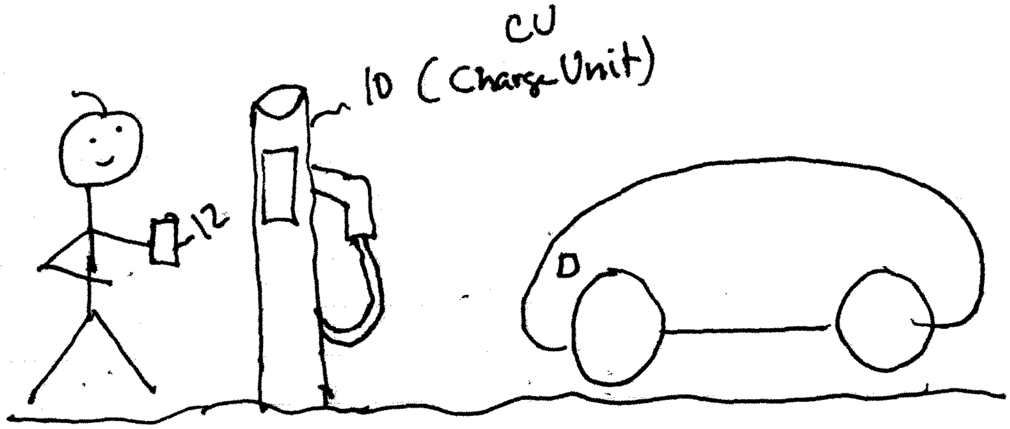


FIG. 1

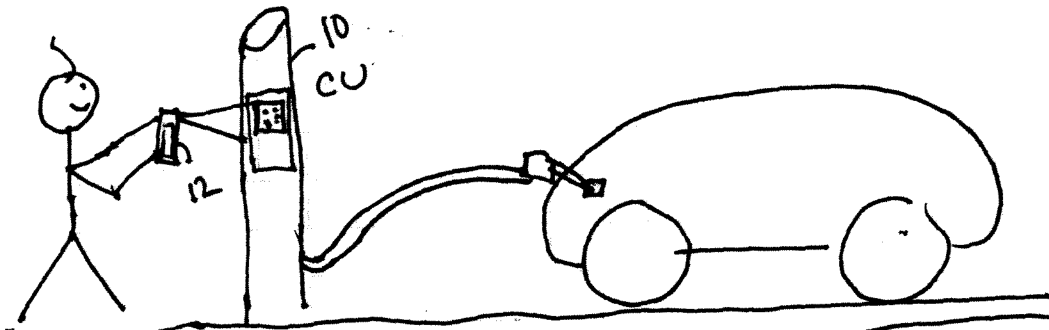


FIG. 2

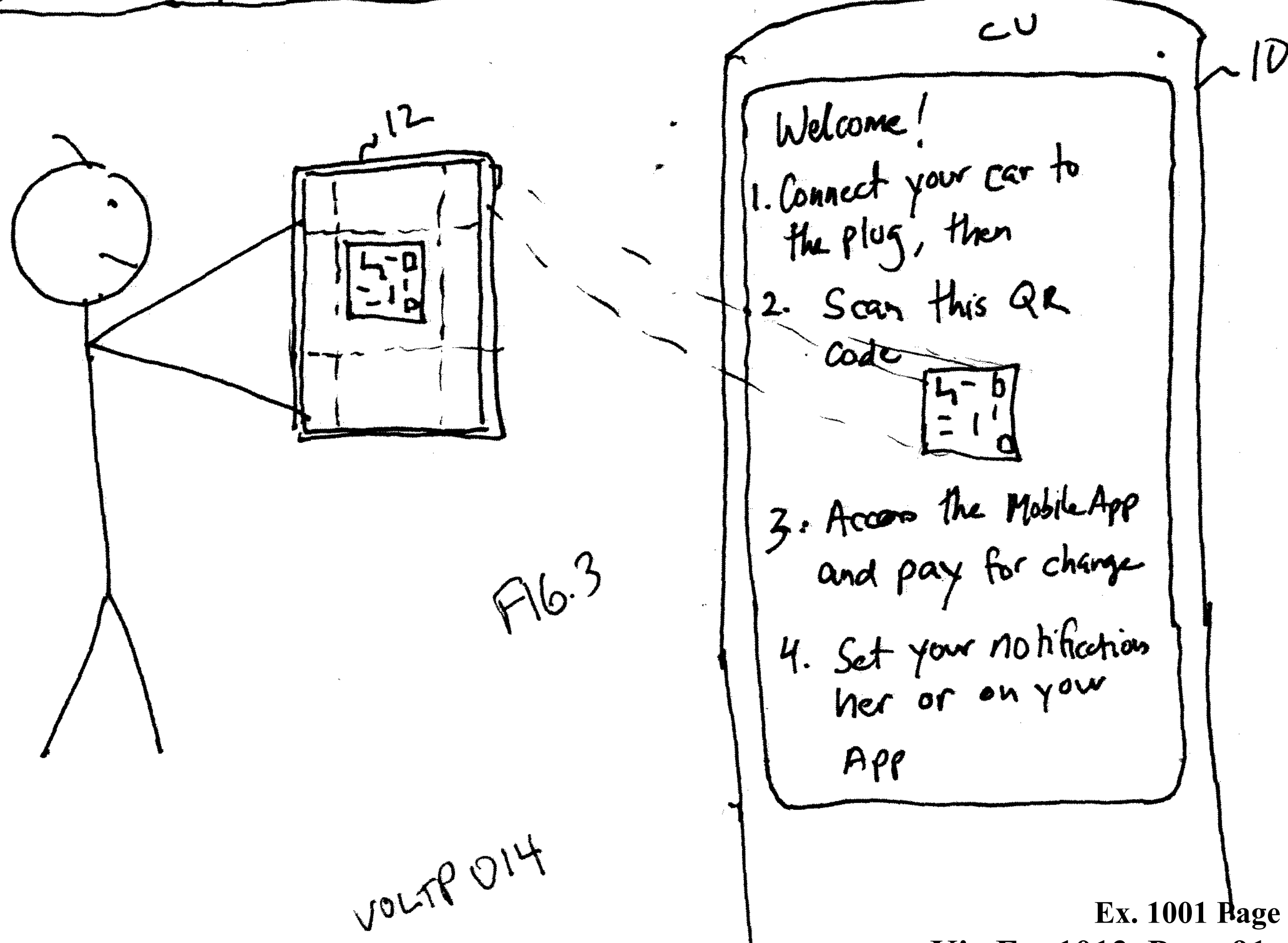


FIG. 3

VOLTP 014

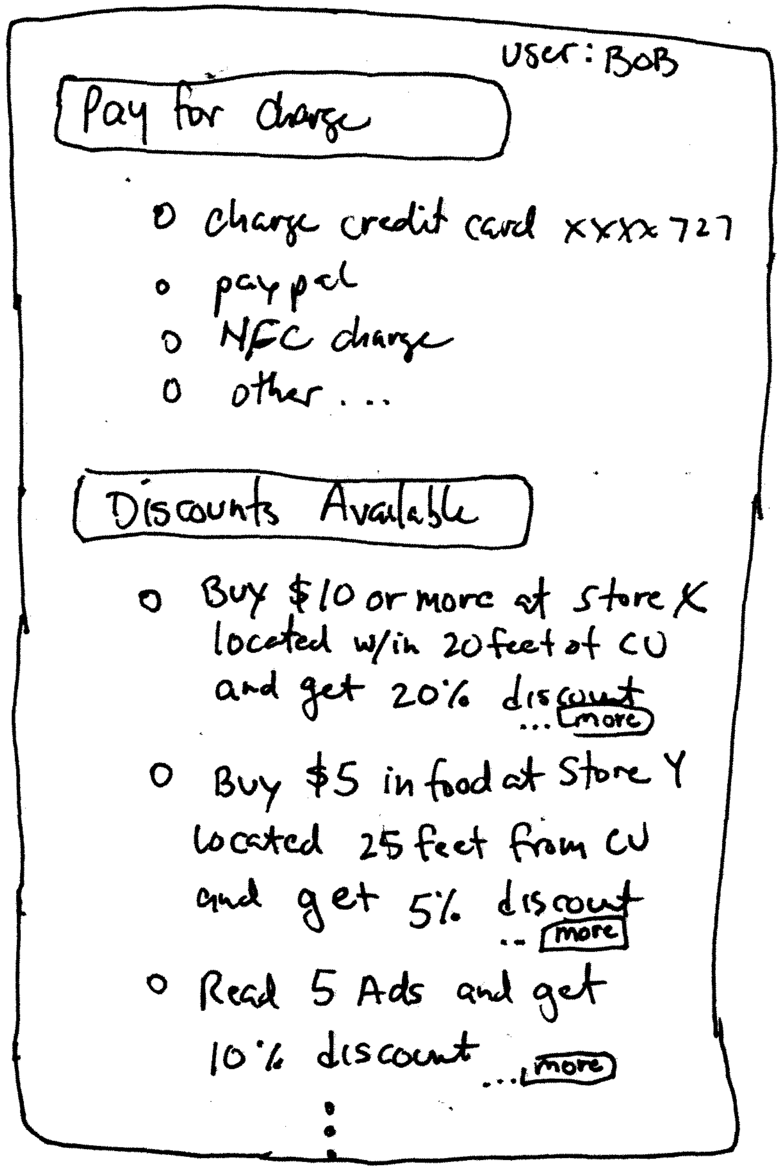


FIG. 4

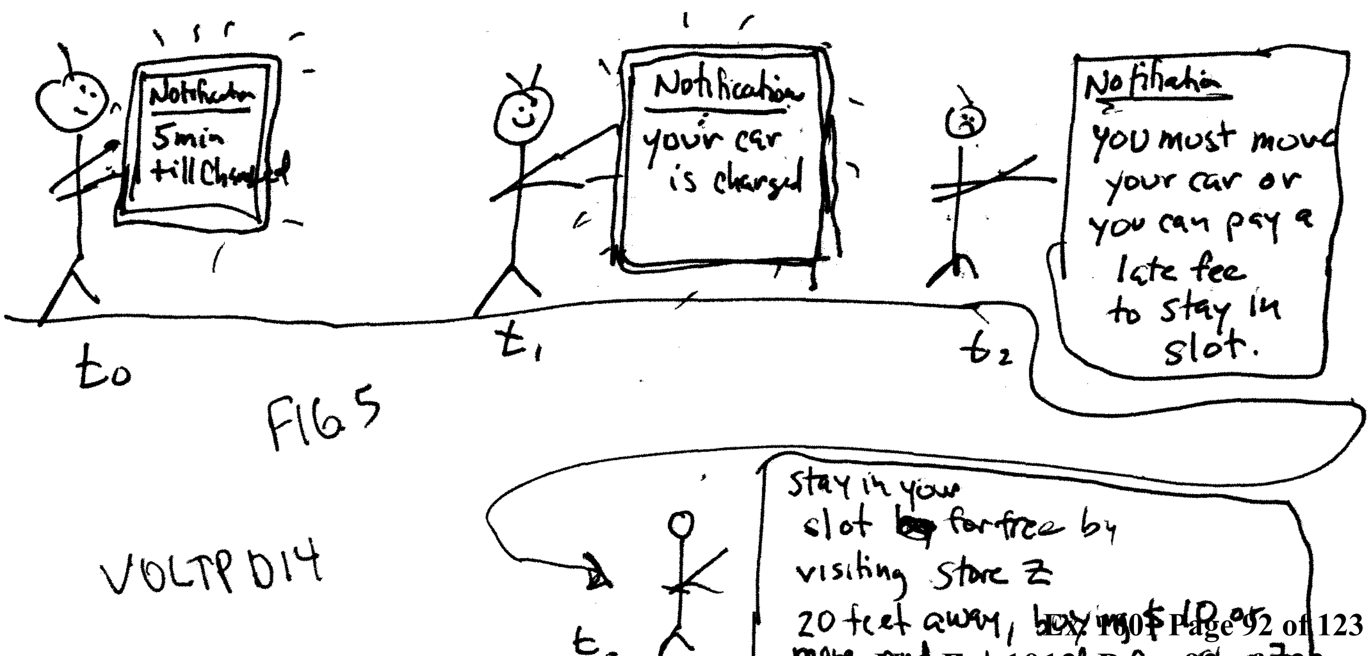


FIG 5

VOLTP014

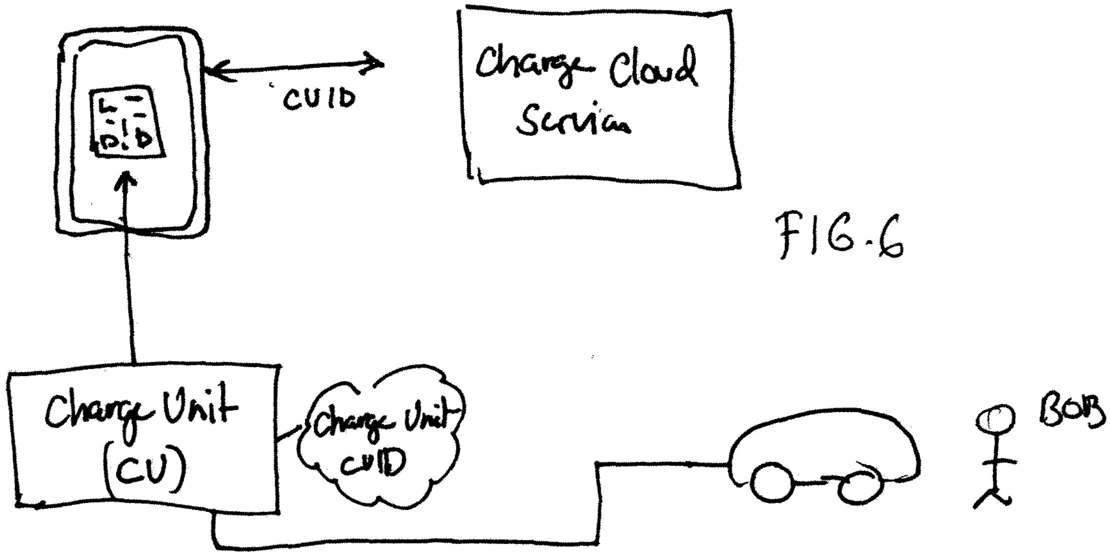


FIG.6

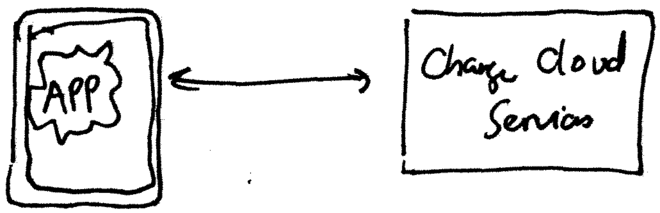


FIG.7

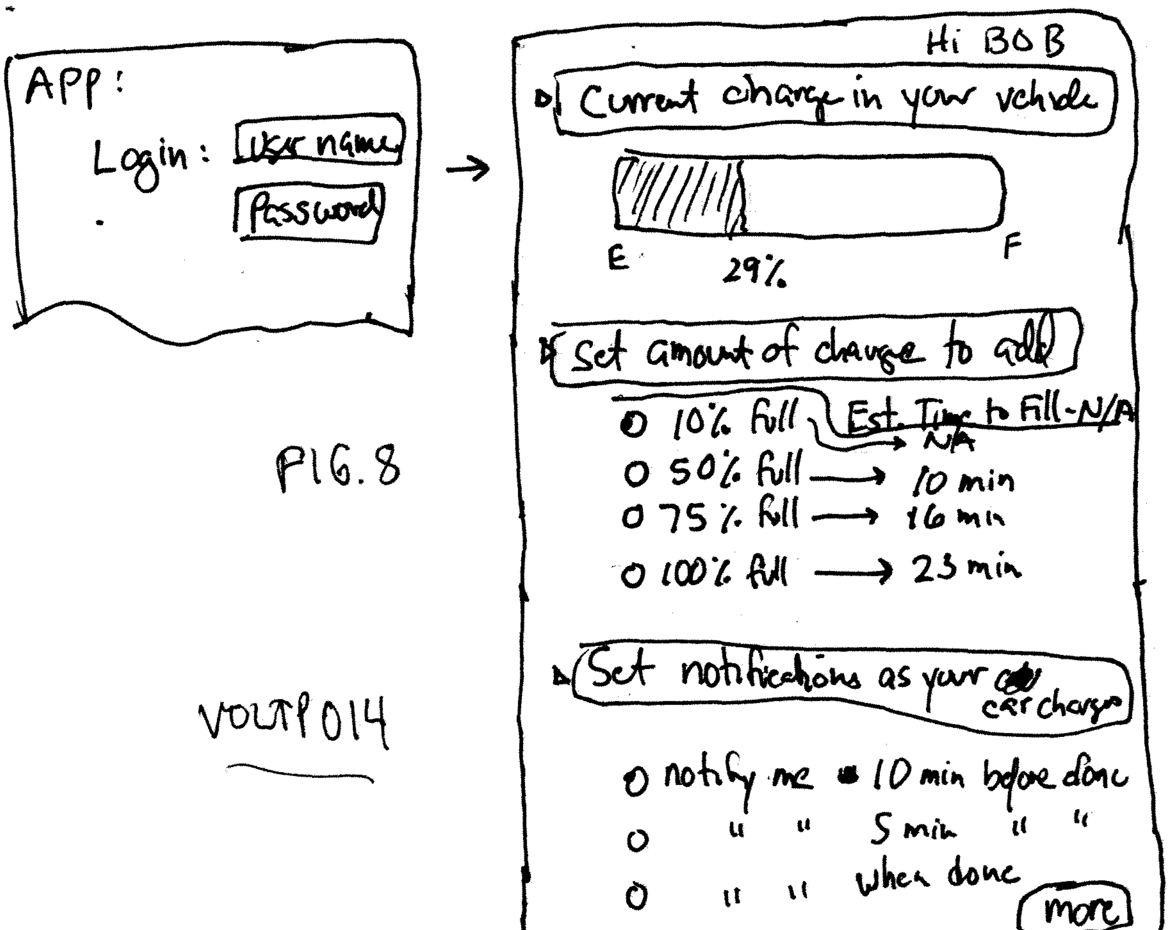


FIG.8

VOLTP014

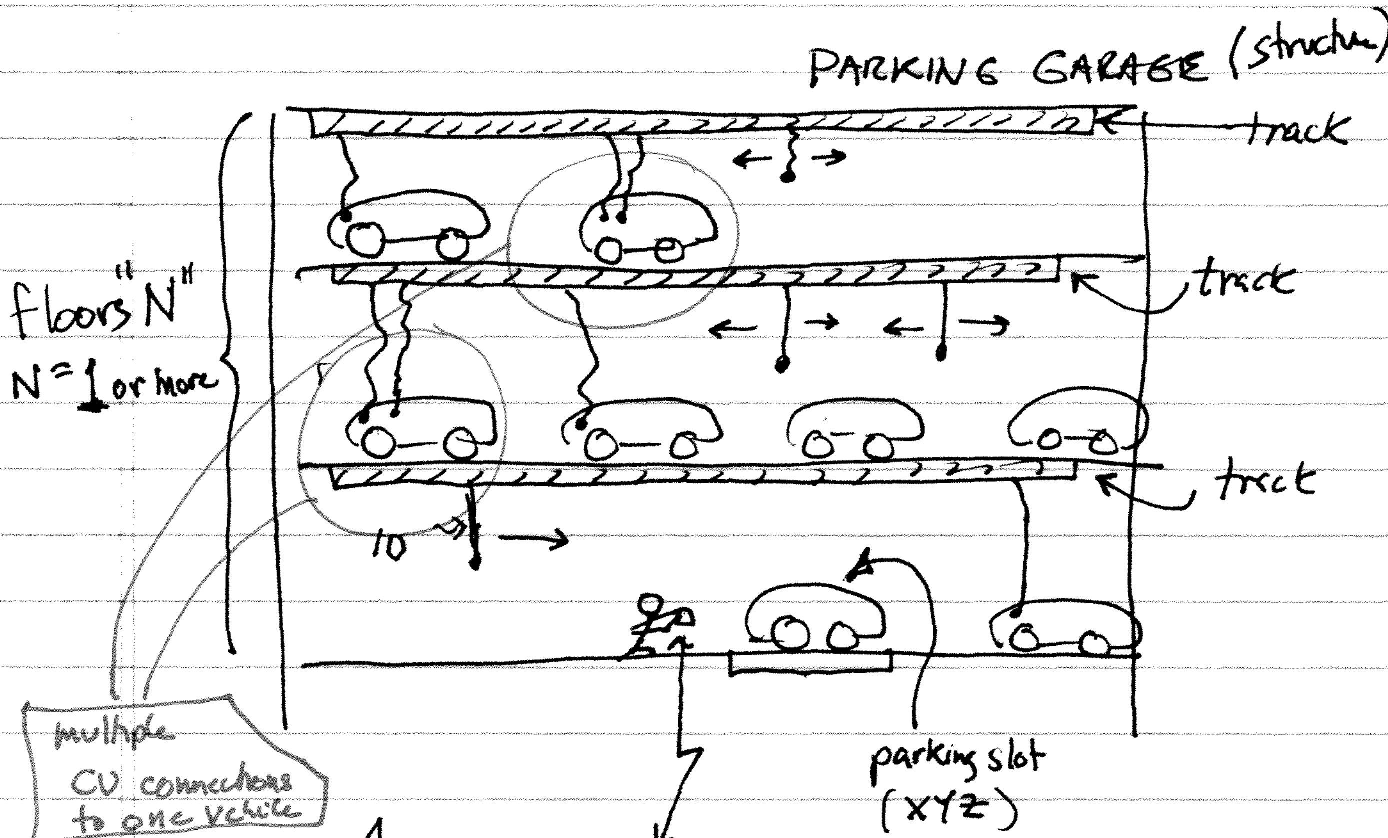
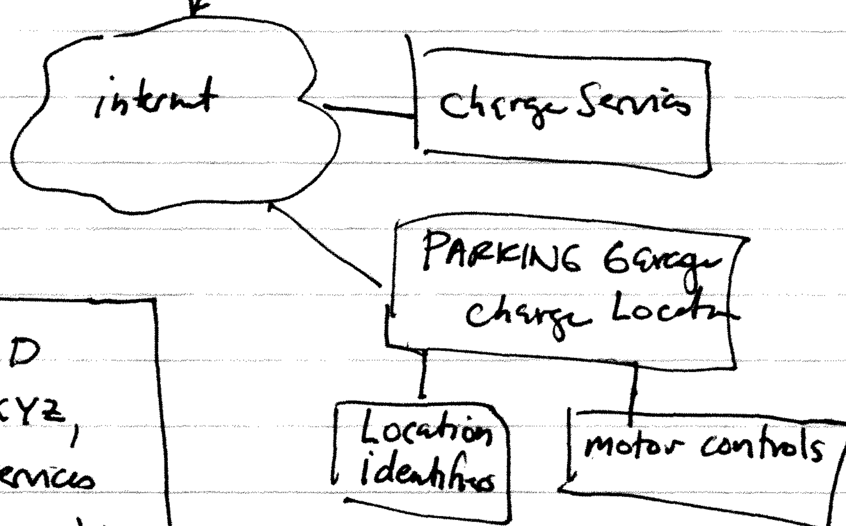


FIG. 1



User can ID parking slot XYZ, and charge services will move charge line to slot location, so track on ceiling will move charge line to user's car

VOLTP015

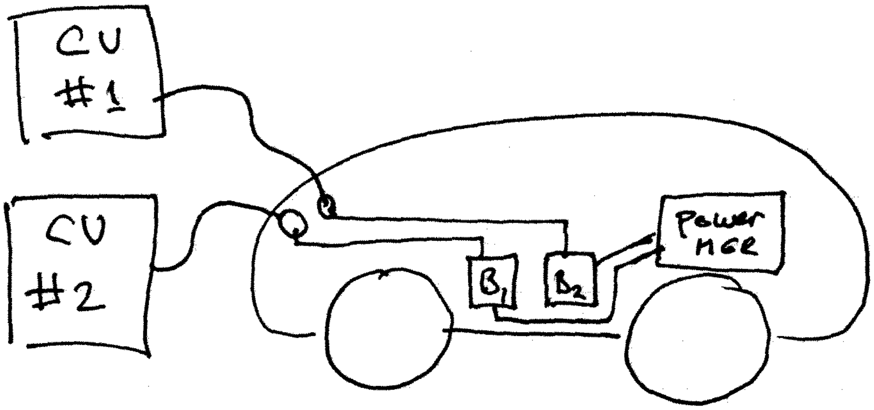


FIG. 2

Segmented battery B_1 and B_2

↓

Separatly connect one charge Unit (CU) to each battery segment

↓

charge time reduced by connecting two (or more) CUS to two (or more) battery segments of one vehicle

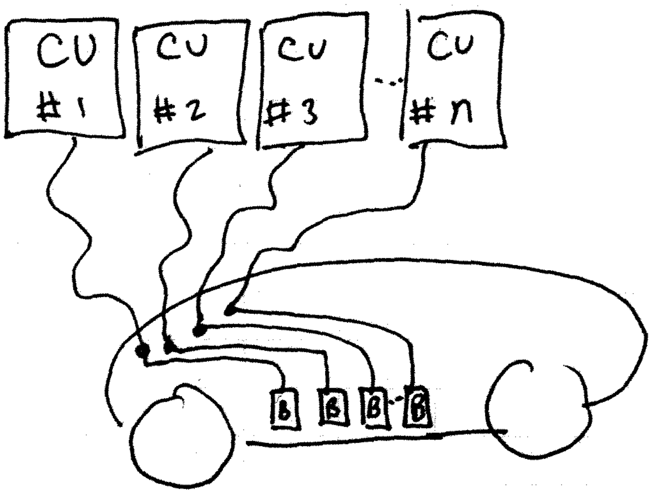
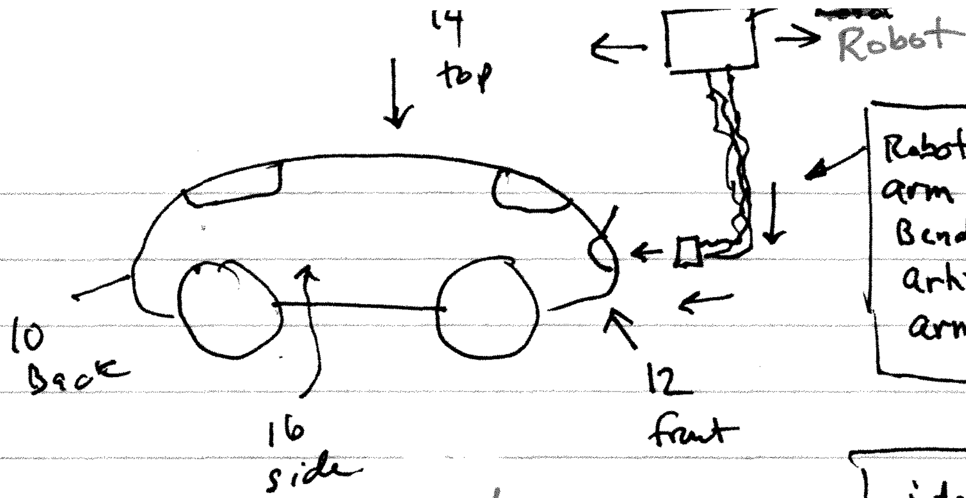


FIG. 3

multiple CUs connected to respective separate segments of batteries of a single vehicle (charge time reduced)

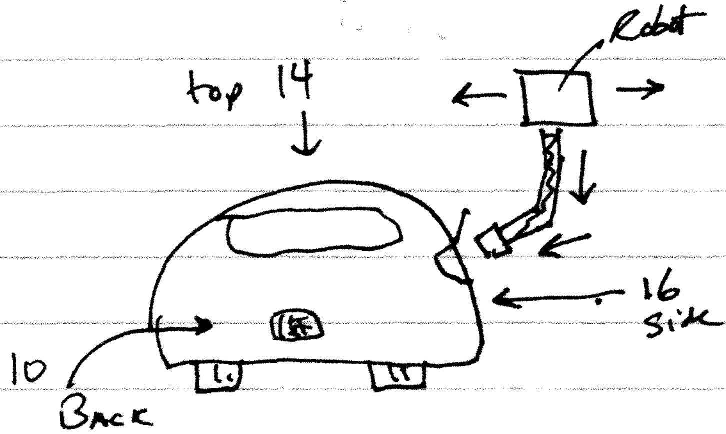
VOLTP015



Robot arm with Bends or articulating arm

identifies location of plug on car and positions itself to make connection

FIG. 1

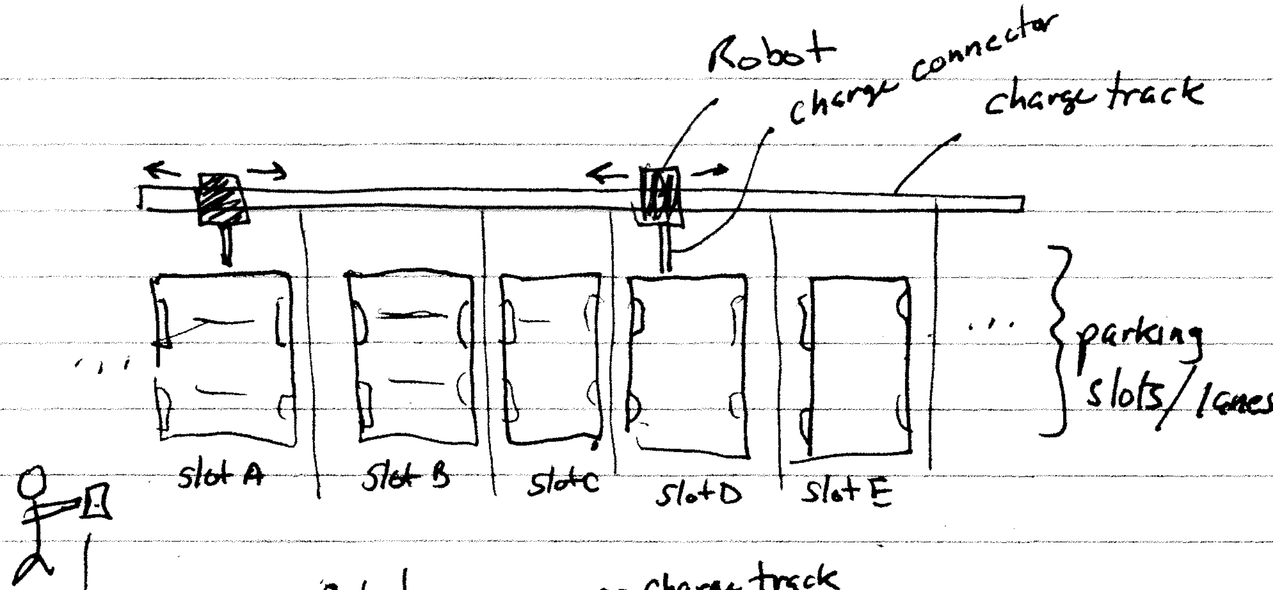


(Self Positioning Robot.)

FIG. 2

Robot can be mounted on ceiling, floor, wall, or cart move on wheels or track

VOLTP016



Charge ~~track~~ Robot moves on charge track to charge cars based on charge reservation. If user reserves charge, the robot will id the slot and automatically plug into car to transfer charge. When done, user is notified by application, and smartphone or device.

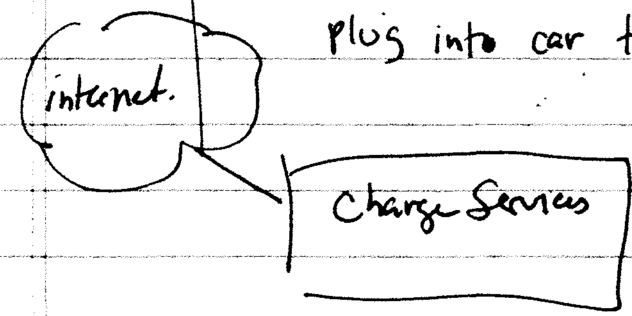


FIG. ~~6~~ 3

VOLTP016

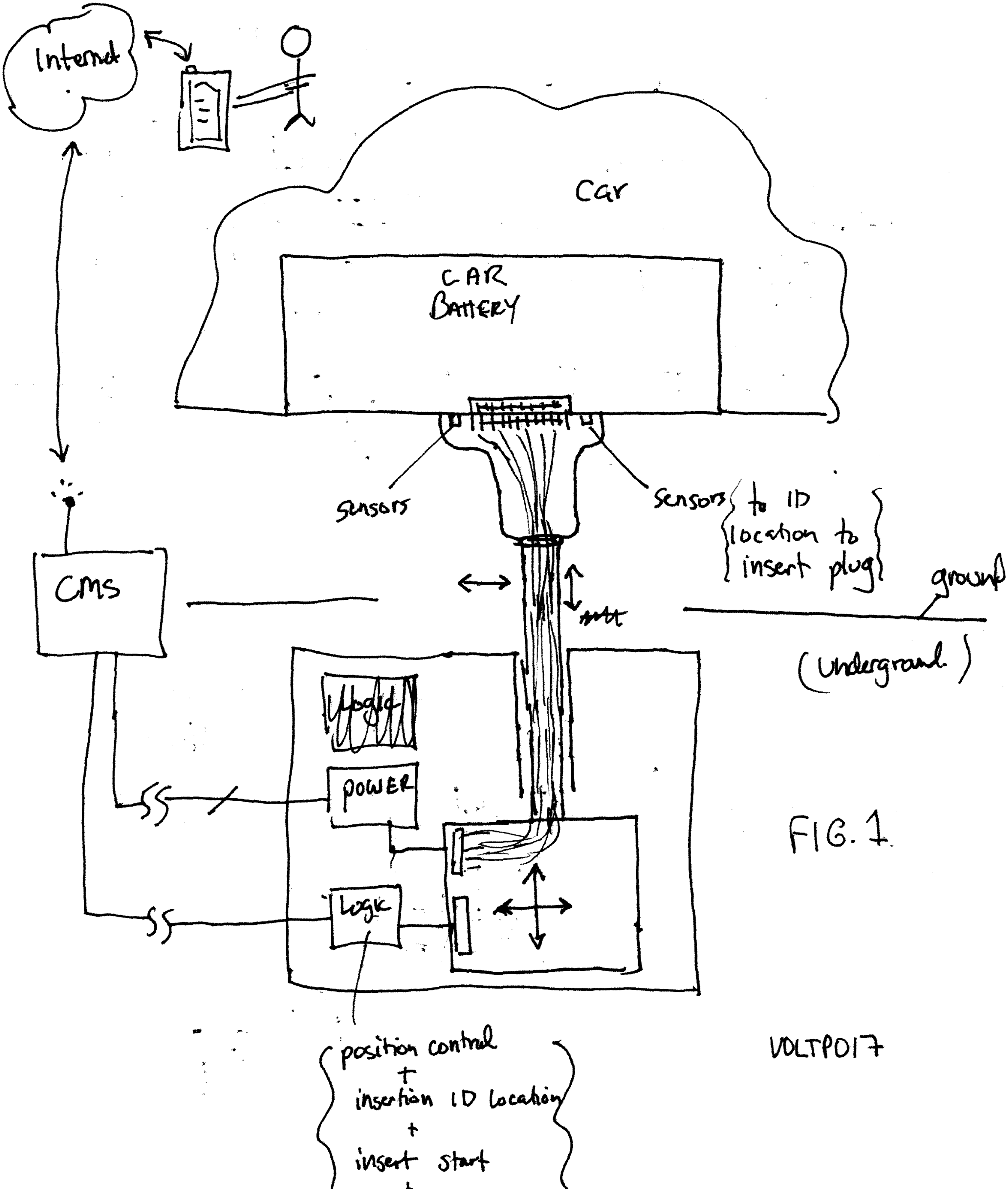


FIG. 1

VOLTP017

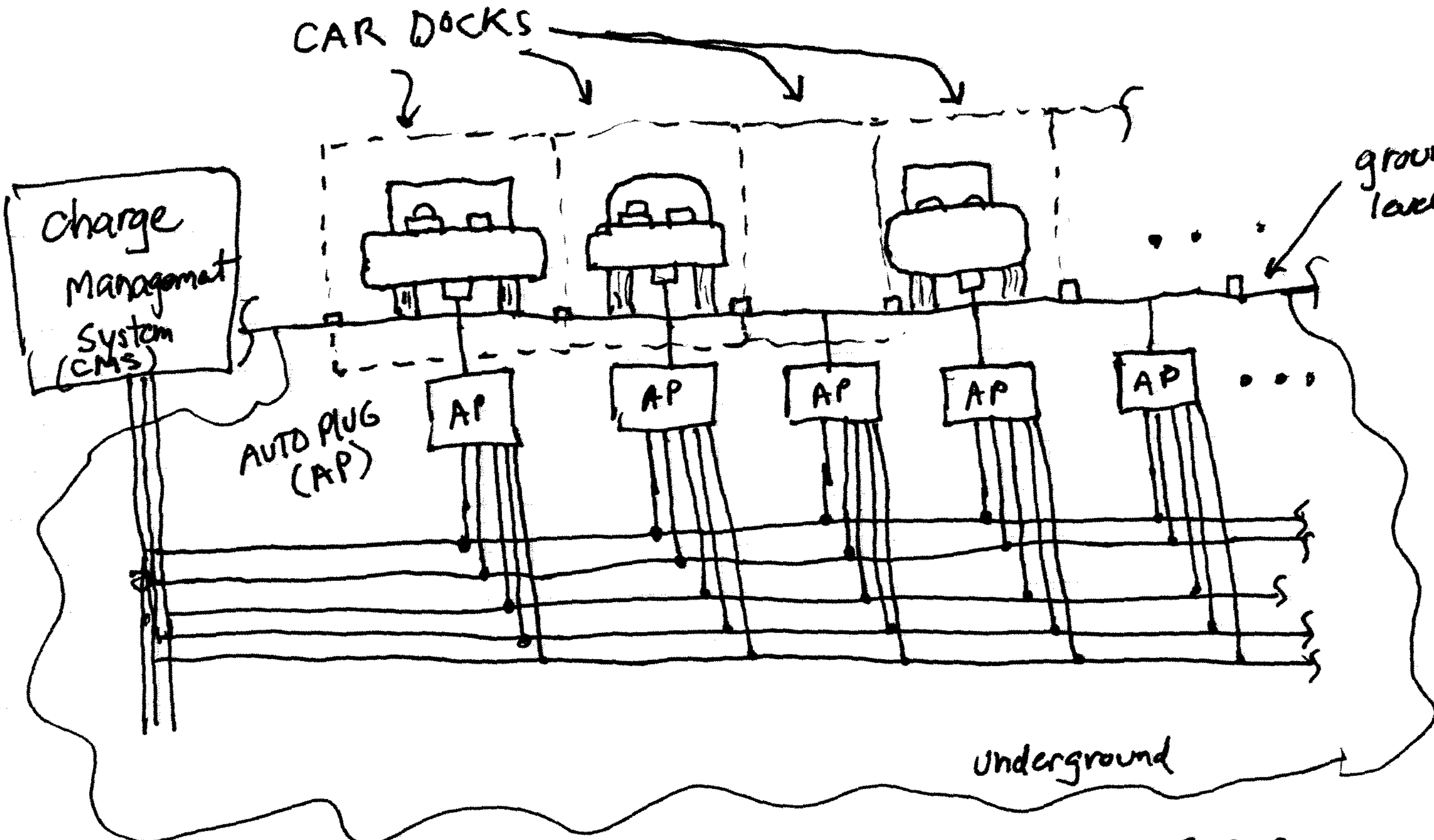


FIG. 2

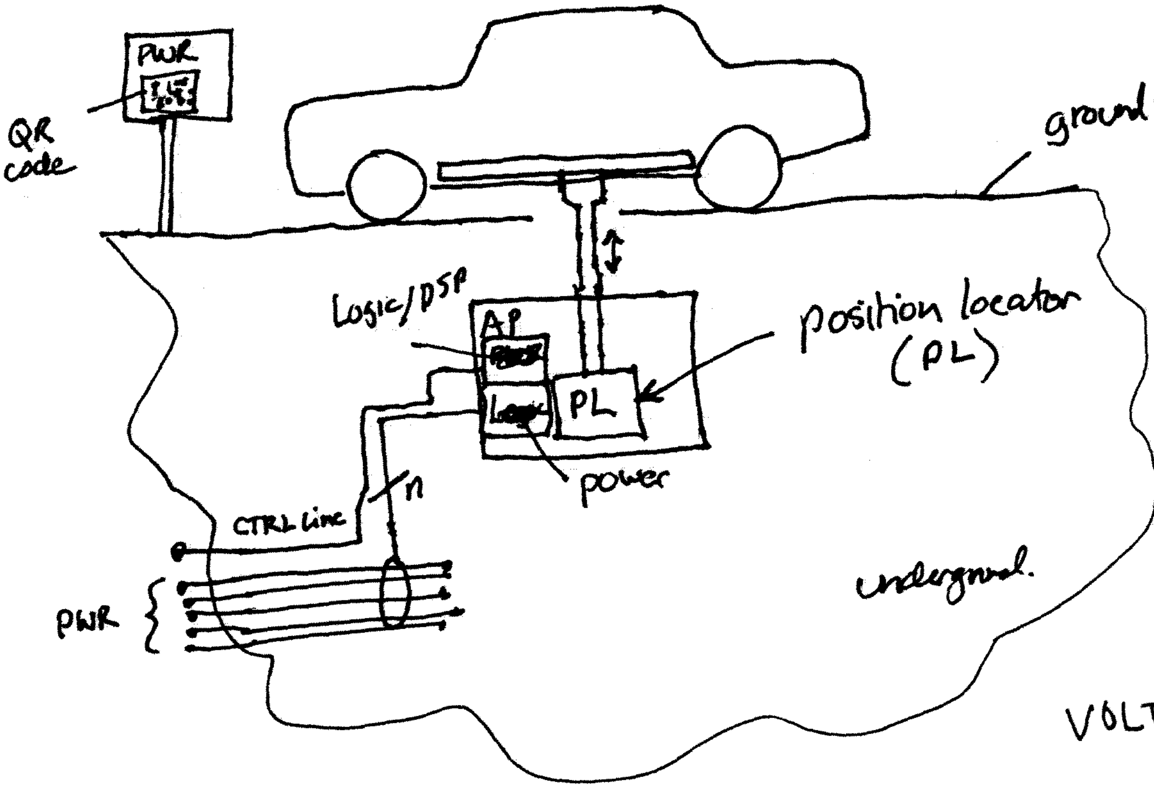


FIG. 3

VOLTPD17

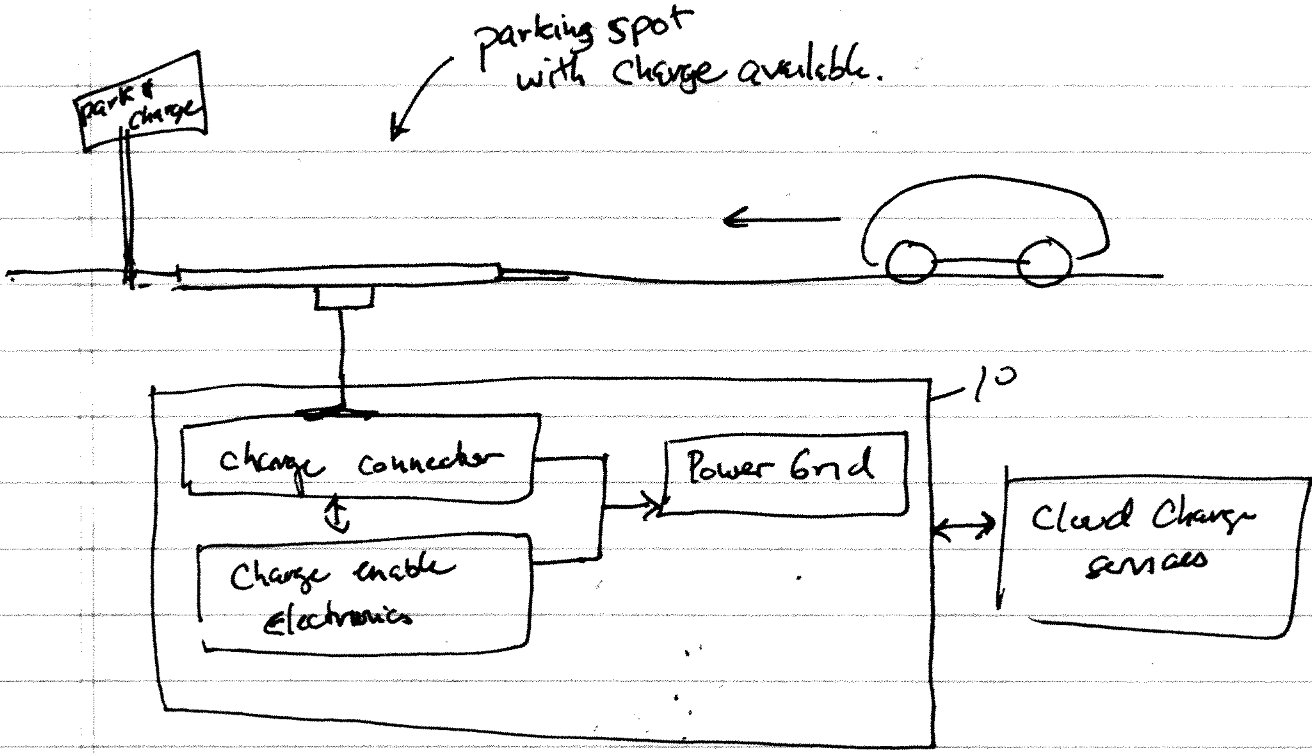


FIG. 4

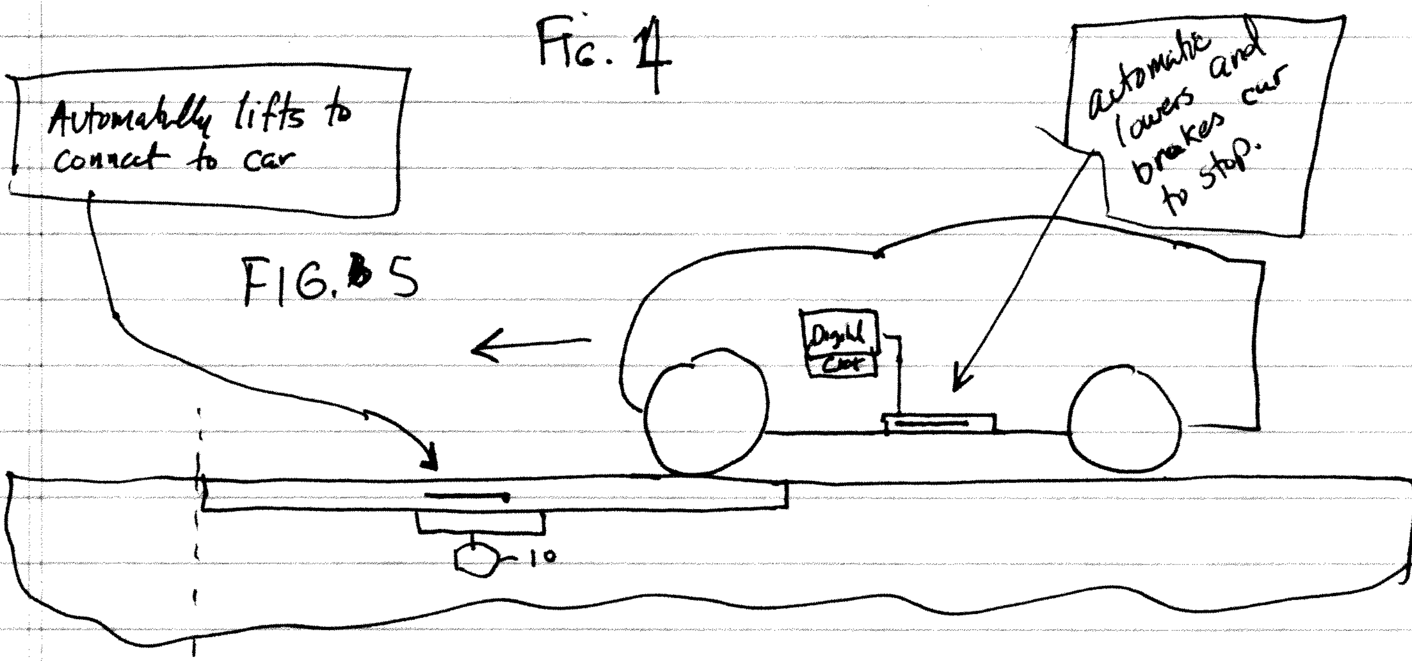


FIG. 5

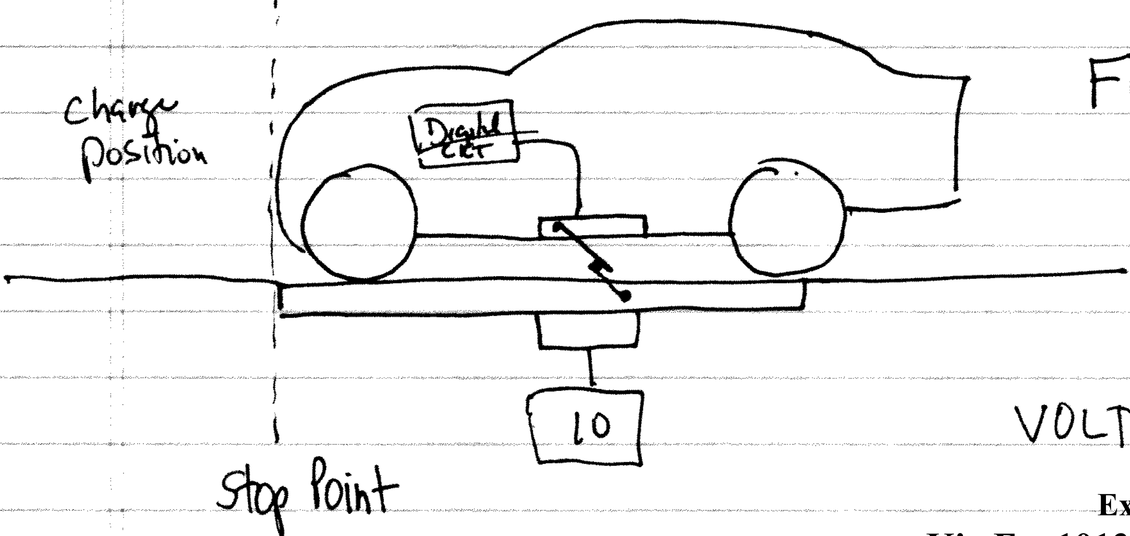


FIG. 6

VOLTP017

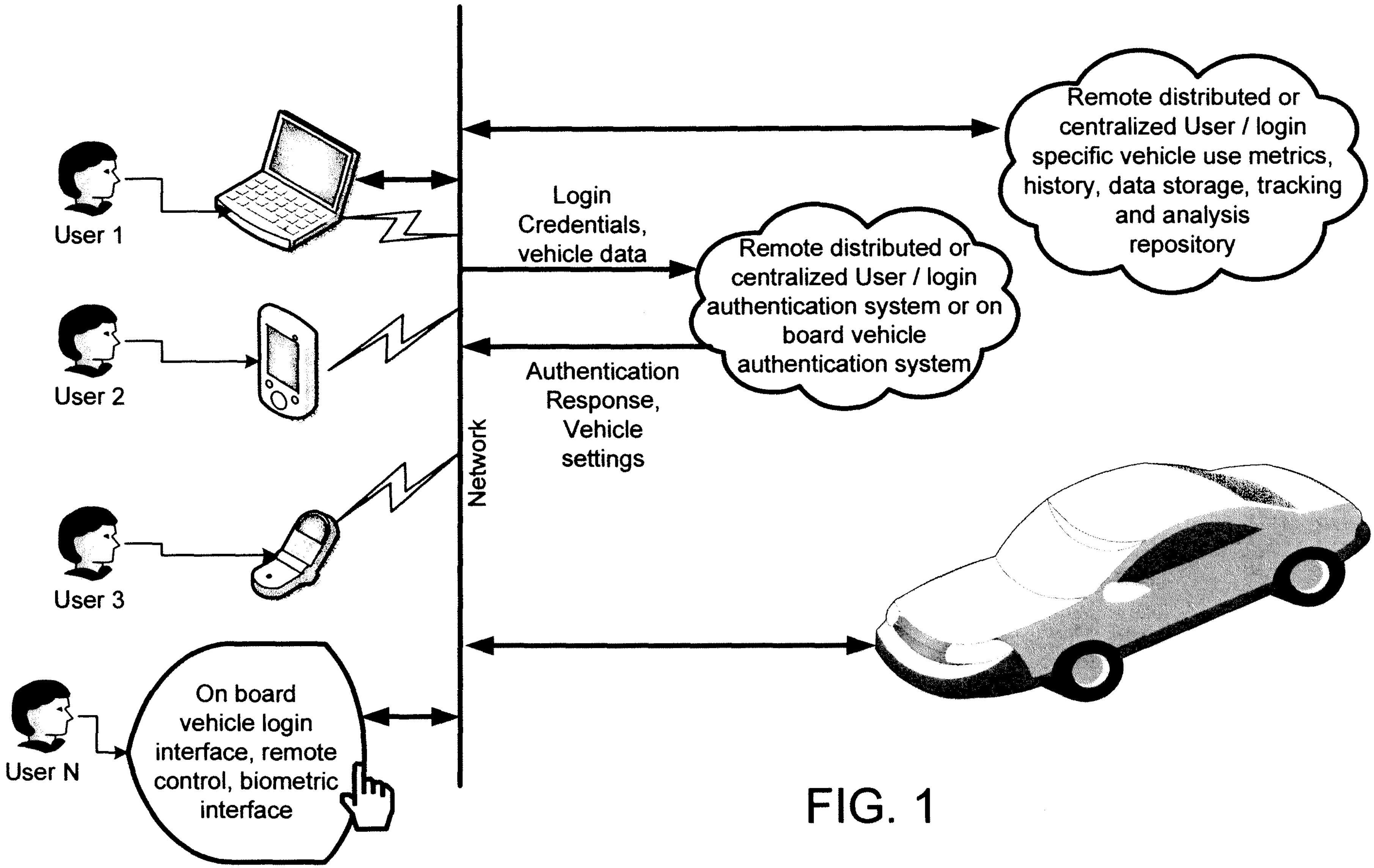

User 1
User 2
User 3
User N
On board vehicle login interface, remote control, biometric interface
Network
Login Credentials, vehicle data
Authentication Response, Vehicle settings
Remote distributed or centralized User / login authentication system or on board vehicle authentication system
Remote distributed or centralized User / login specific vehicle use metrics, history, data storage, tracking and analysis repository

FIG. 1

User 1

User 1 Logins	User 1 Roles	User 1 Vehicles
• Administrator(edit) Add New	• Owner(edit) • Weekend driving(edit) • Commute driving(edit) Add New	• Ford SUV(edit) • Honda Hybrid(edit) Add New

User 2

User 2 Logins	User 2 Roles	User 2 Vehicles
• Child(edit)	• School commute(edit) • Errands(edit)	• Honda Hybrid

User 1

User 2 Logins	User 2 Roles	User 2 Vehicles
• Child(edit) Add New	• School commute(edit) • Errands(edit) Add New	• Honda Hybrid Add New

FIG. 2

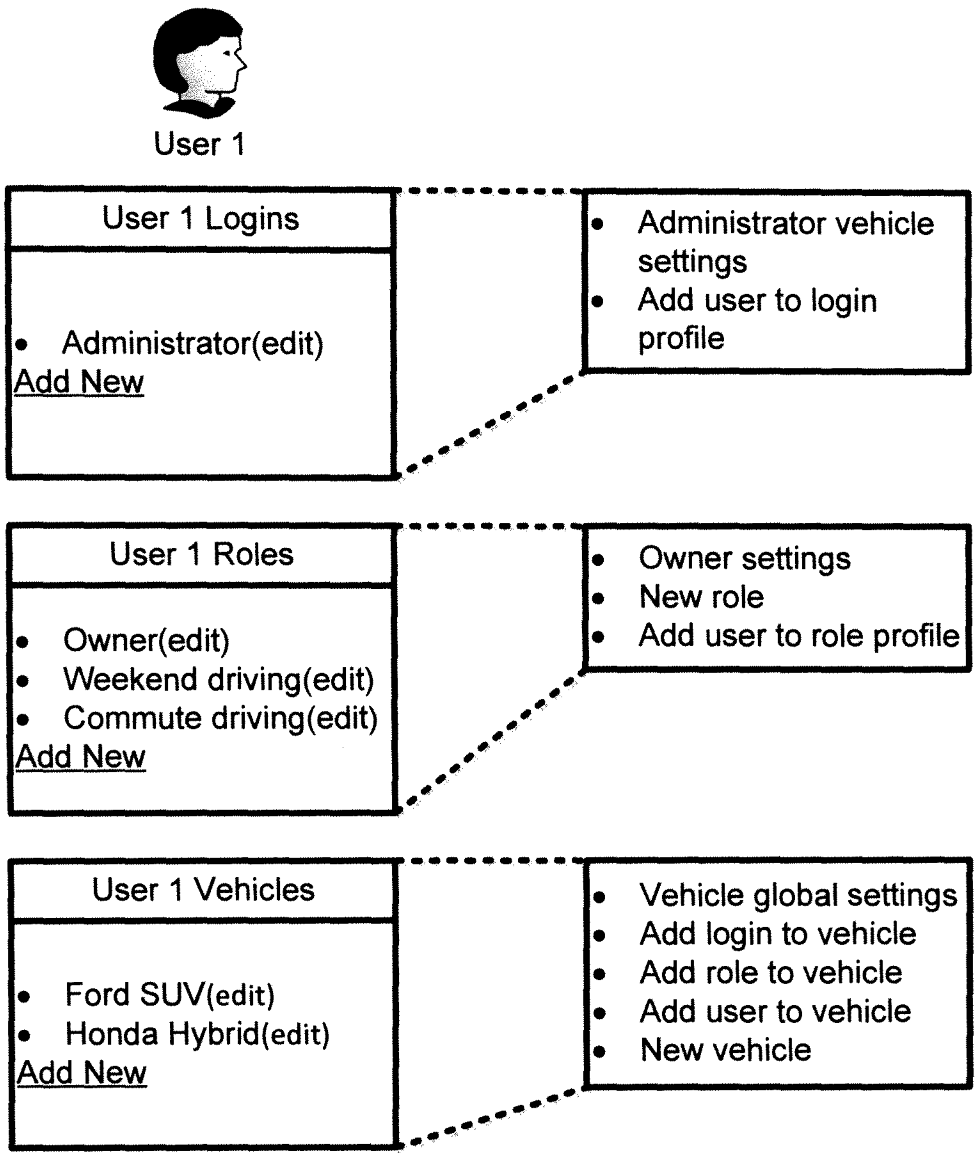

User 1
User 1 Logins
Administrator(edit)
Add New
Administrator vehicle settings
Add user to login profile
User 1 Roles
Owner(edit)
Weekend driving(edit)
Commute driving(edit)
Add New
Owner settings
New role
Add user to role profile
User 1 Vehicles
Ford SUV(edit)
Honda Hybrid(edit)
Add New
Vehicle global settings
Add login to vehicle
Add role to vehicle
Add user to vehicle
New vehicle

FIG. 3

User 2

User 2's login settings for login: CHILD	
Fuel use settings	• Electric battery • Plug in • Fuel • Hybrid
Driving characteristics	• Speed restrictions • Fuel use restrictions
Location based settings	• GPS aided travel restrictions • Map restrictions • Travel radius boundaries • Dynamically load maps • Dynamically load directions • Dynamically load fuel • Dynamically load charge • Dynamically load battery • Fuel purchase location restrictions
Time based use and restrictions	• Day driving • Night driving • Time specific driving
Automatic purchase settings	• Financial institution linking • Fuel purchase settings • Charge time purchase settings • Battery purchase settings • Car wash purchase settings

User editable

Admin or restricted

FIG. 4

User 2

User 1's login settings for login: CHILD	
Tracking & metrics	• Vehicle cameras • Vehicle event recording • Mileage usage characteristics • Top & average speeds • Driving history maps and graphs • Fuel efficiency • Wear and tear notifications
Comfort	• Climate • Seats positions • Seat heater / cooler • Suspension/ride settings • Entry lighting • Remote start / stop
Entertainment	• Radio Memory • Internet access settings • Streaming services
Driving Modes	• Sport • Comfortable • Soft • Off-road • High performance • Economy
Refueling routing and purchase	• Incentive based fuel finder • Refueling availability maps • Offers • History • Metrics

User editable

Admin or restricted

FIG. 5

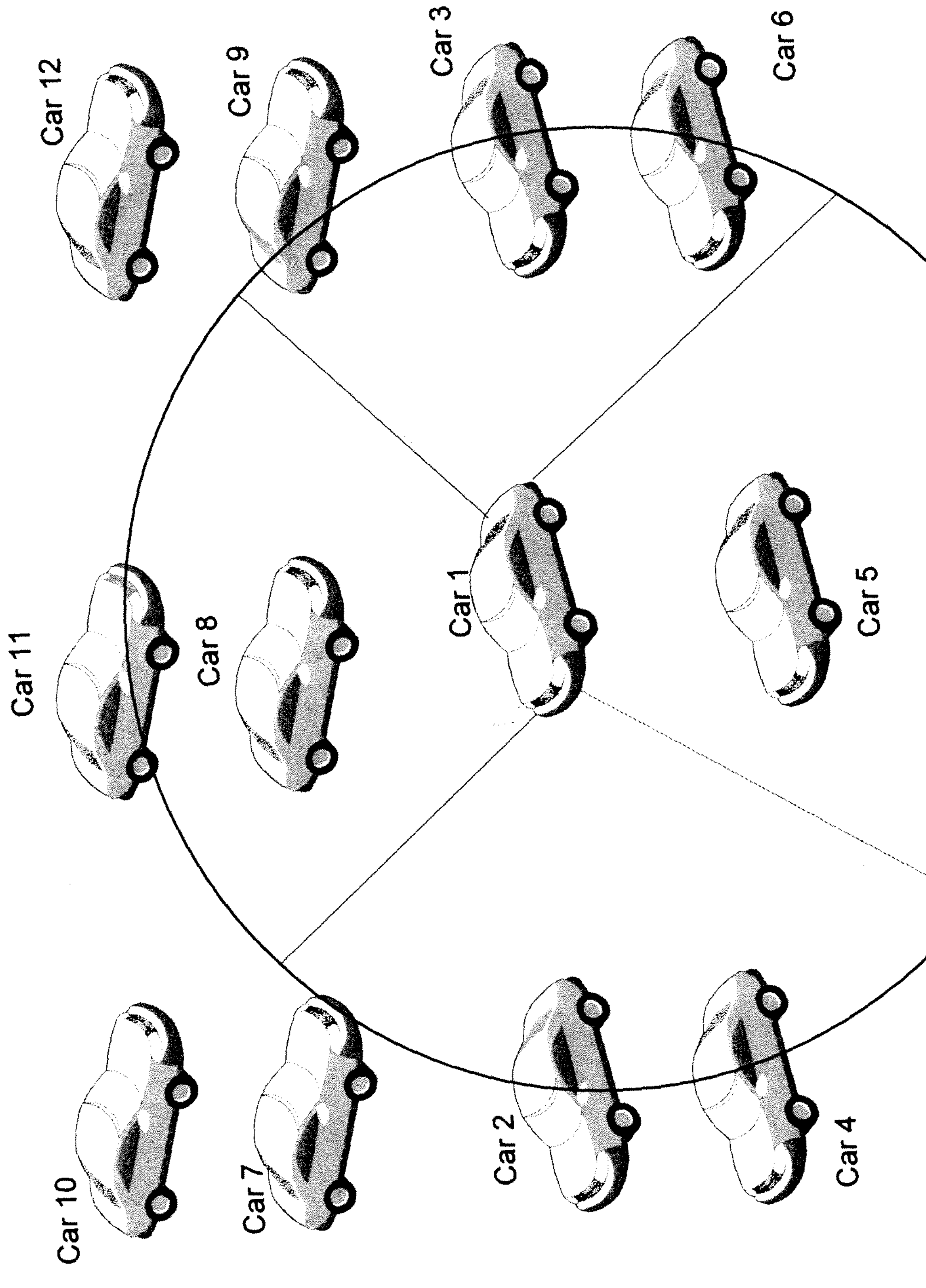

Car 12
Car 9
Car 3
Car 6
Car 11
Car 8
Car 1
Car 5
Car 10
Car 7
Car 2
Car 4

FIG. 1A

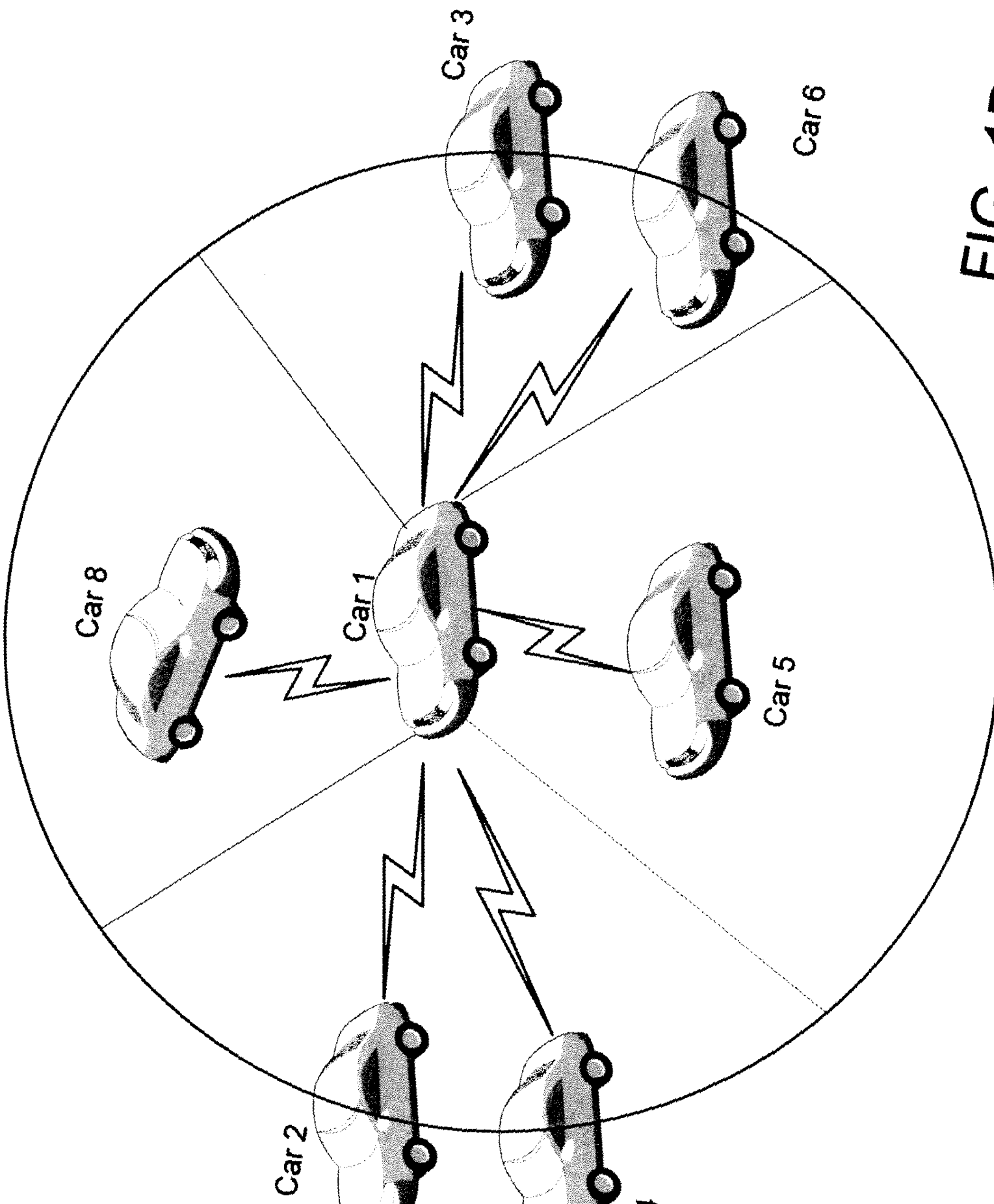


FIG. 1B

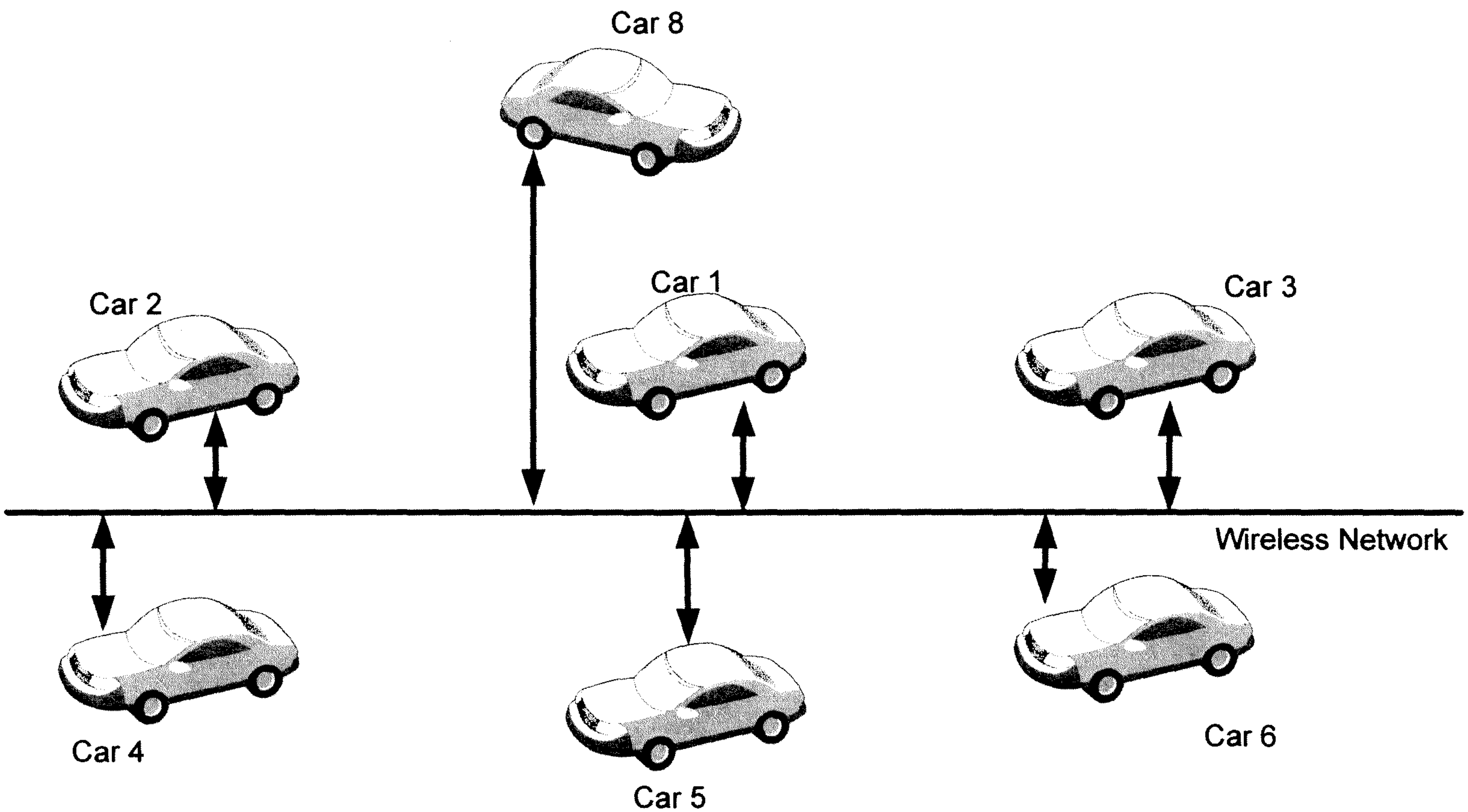


FIG. 1C

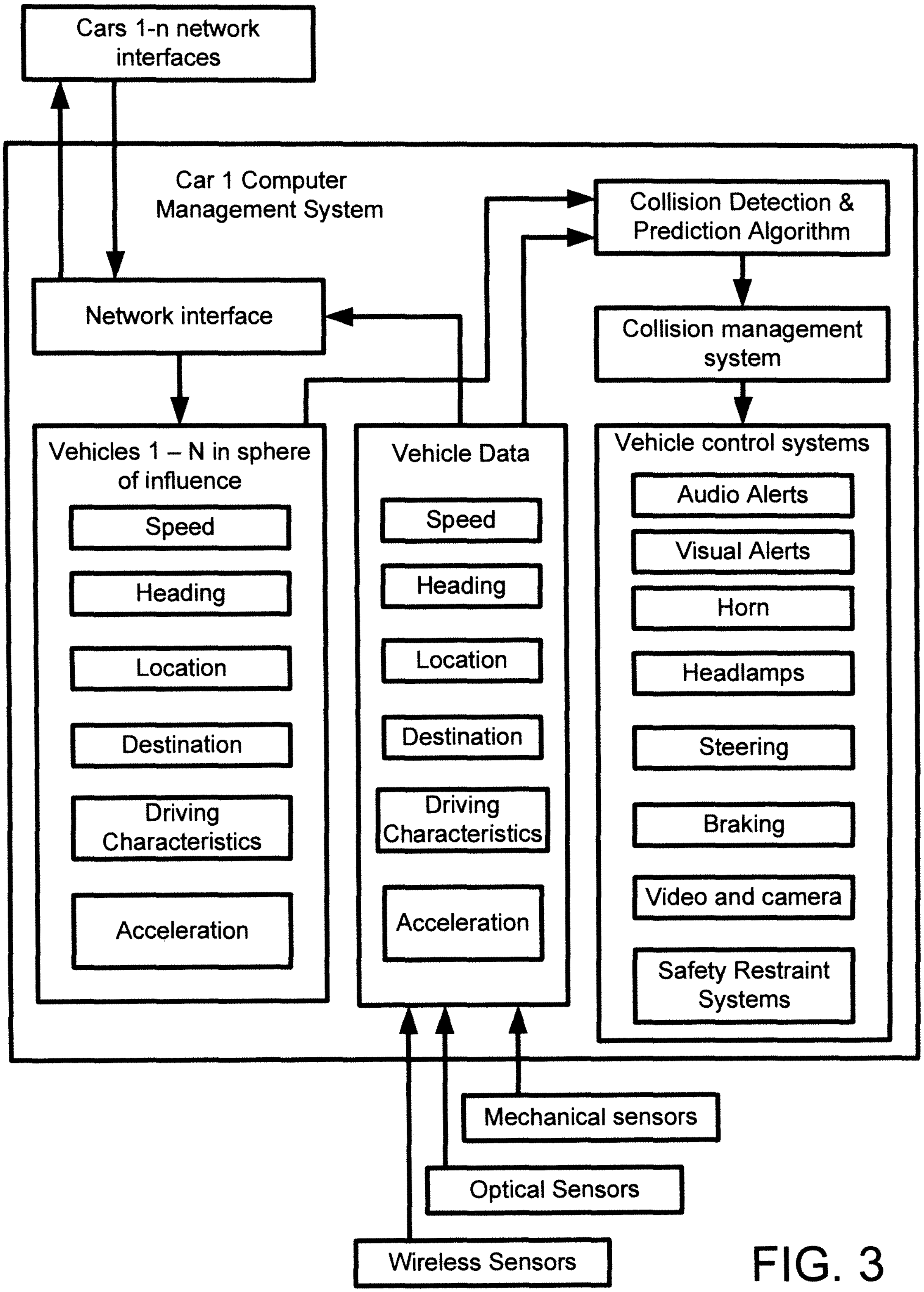

Cars 1-n network interfaces
Car 1 Computer Management System
Collision Detection & Prediction Algorithm
Network interface
Collision management system
Vehicles 1 – N in sphere of influence
Speed
Heading
Location
Destination
Driving Characteristics
Acceleration
Vehicle Data
Speed
Heading
Location
Destination
Driving Characteristics
Acceleration
Vehicle control systems
Audio Alerts
Visual Alerts
Horn
Headlamps
Steering
Braking
Video and camera
Safety Restraint Systems
Mechanical sensors
Optical Sensors
Wireless Sensors

FIG. 3

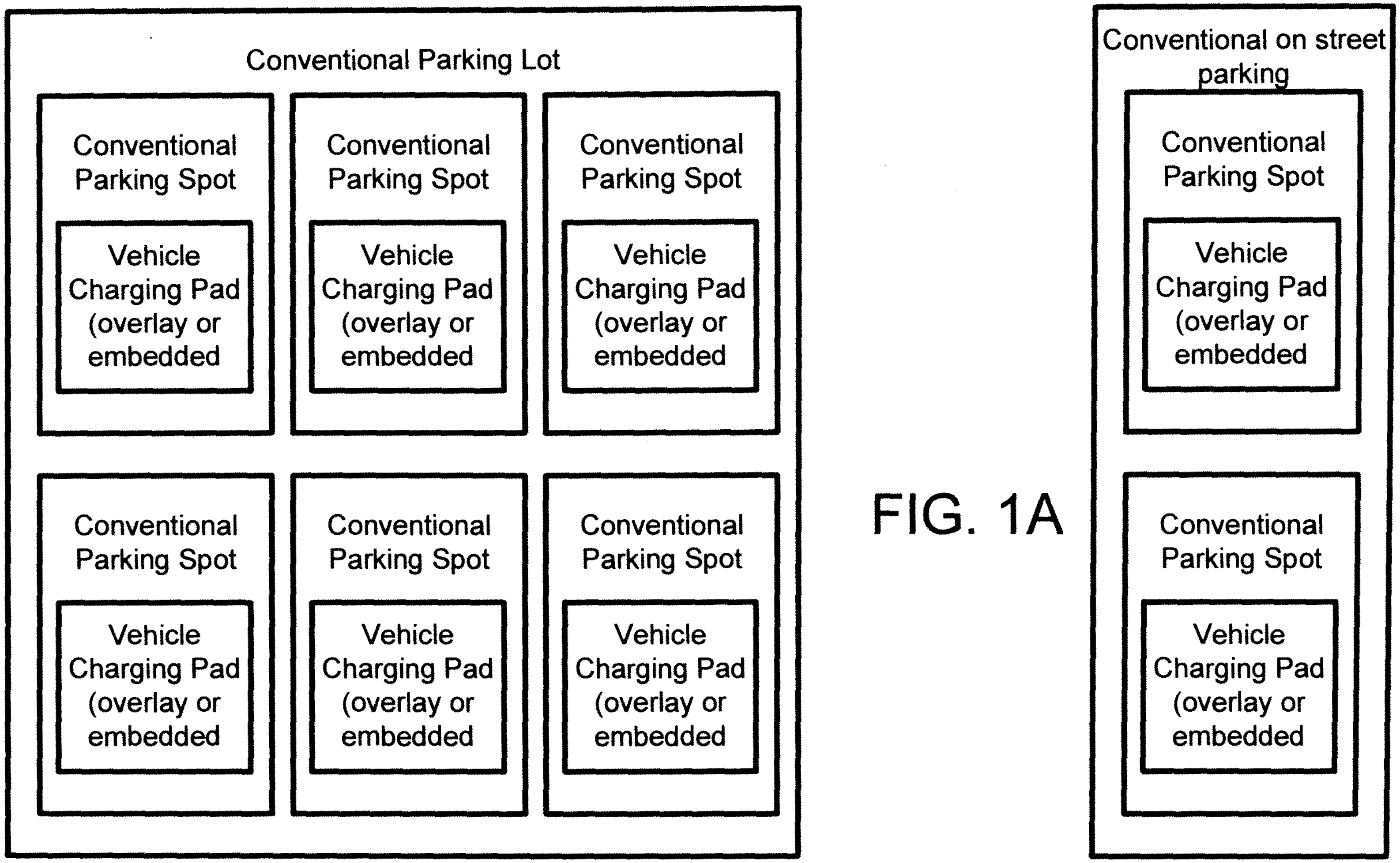

Conventional Parking Lot
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional on street parking
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded

FIG. 1A

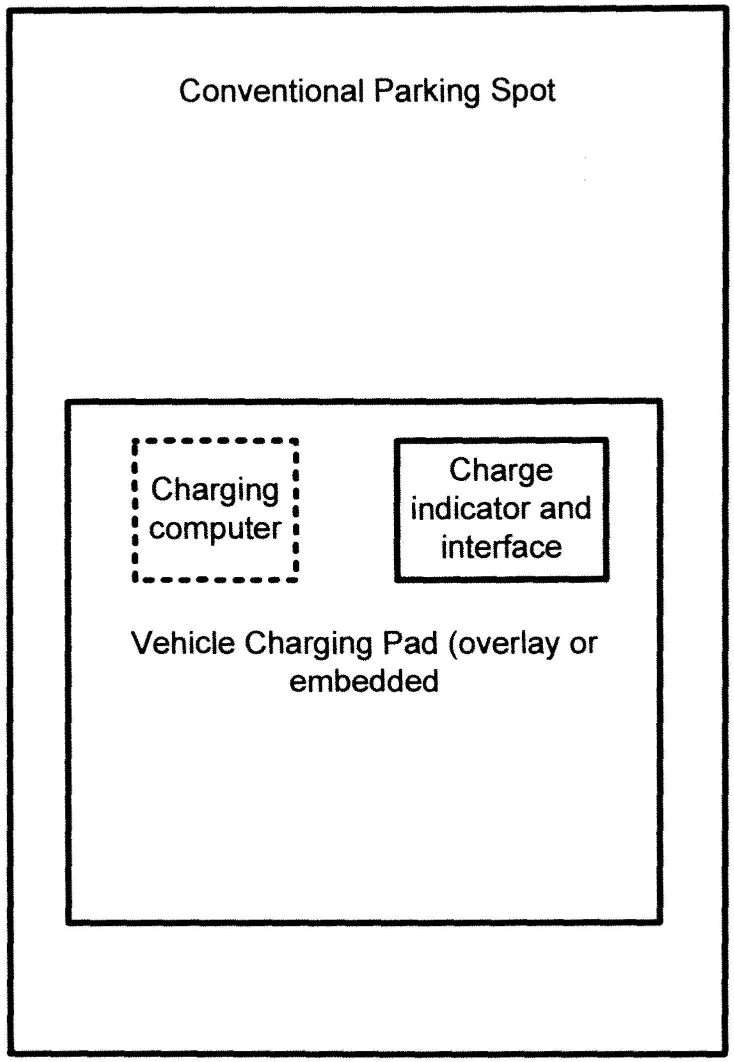

Conventional Parking Spot
Charging computer
Charge indicator and interface
Vehicle Charging Pad (overlay or embedded

FIG. 1B

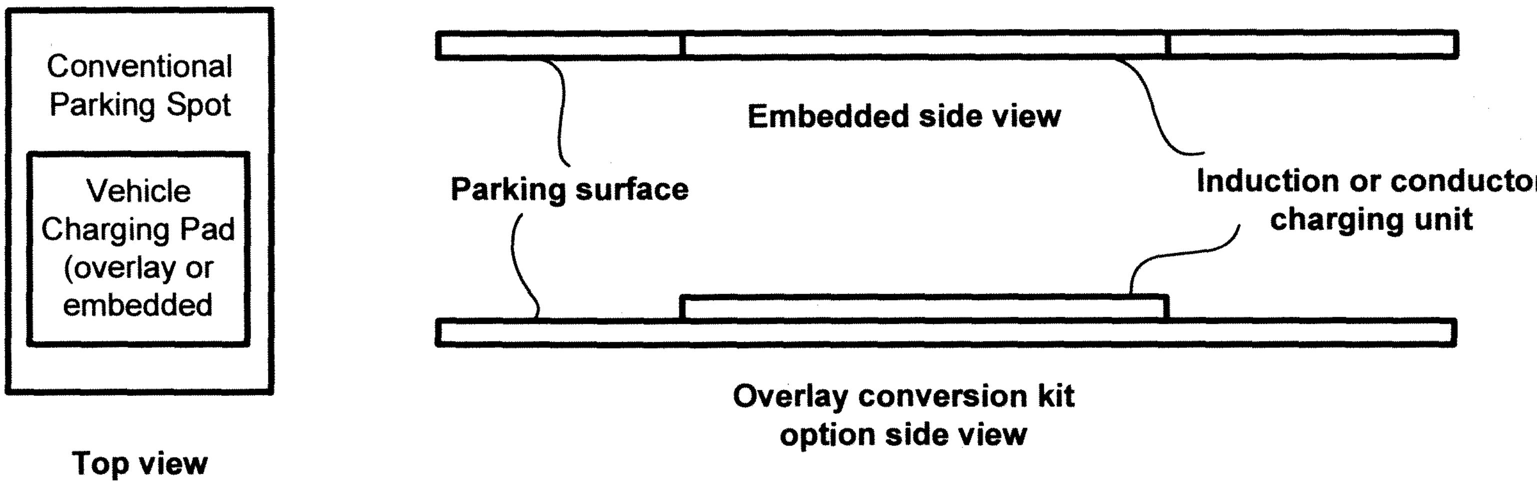

Conventional Parking Spot
Vehicle Charging Pad (overlay or embedded
Top view
Embedded side view
Parking surface
Induction or conductor charging unit
Overlay conversion kit option side view

FIG. 2

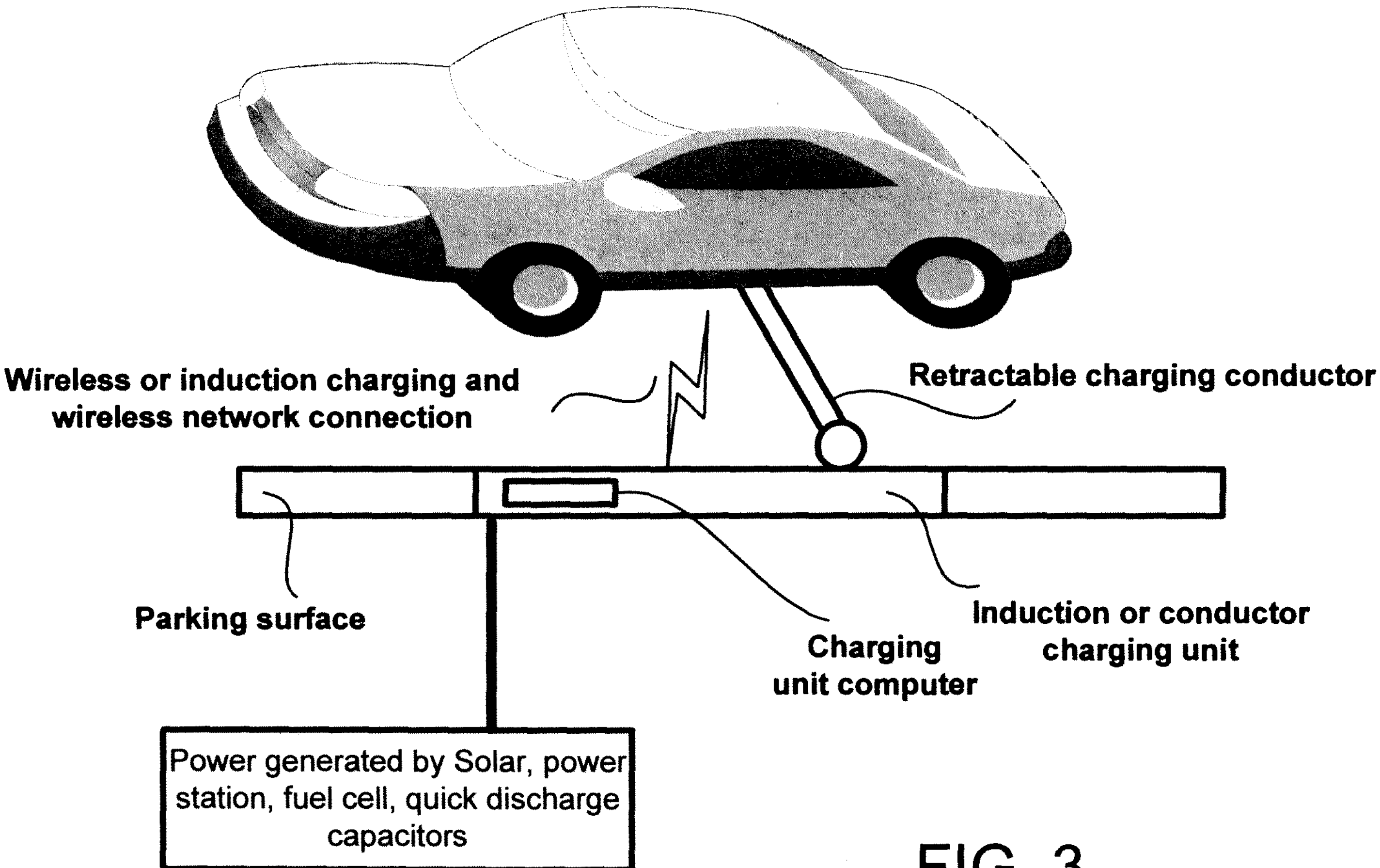

Wireless or induction charging and wireless network connection
Retractable charging conductor
Parking surface
Charging unit computer
Induction or conductor charging unit
Power generated by Solar, power station, fuel cell, quick discharge capacitors

FIG. 3

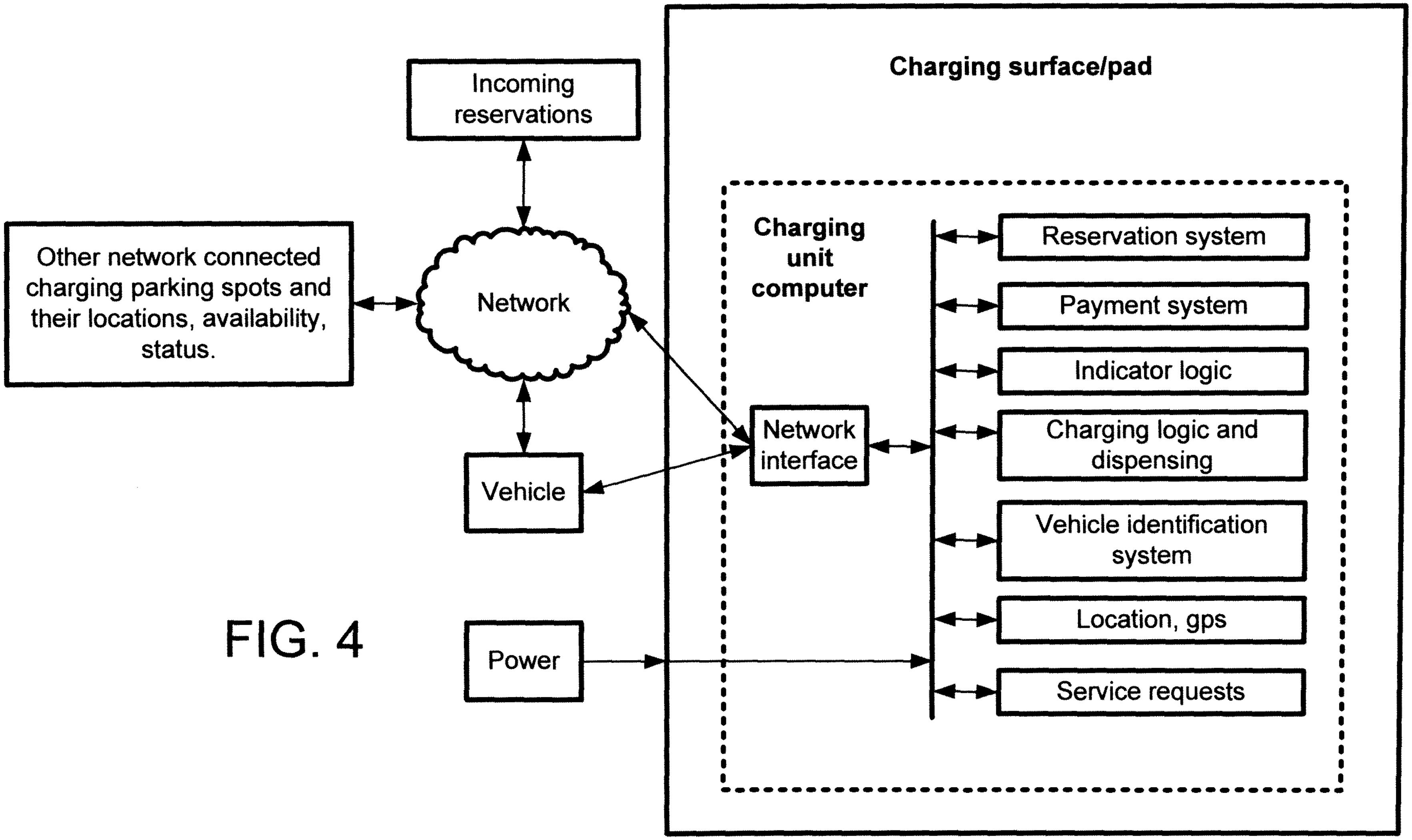

Incoming reservations
Other network connected charging parking spots and their locations, availability, status.
Network
Vehicle
Power
Charging surface/pad
Charging unit computer
Network interface
Reservation system
Payment system
Indicator logic
Charging logic and dispensing
Vehicle identification system
Location, gps
Service requests

FIG. 4

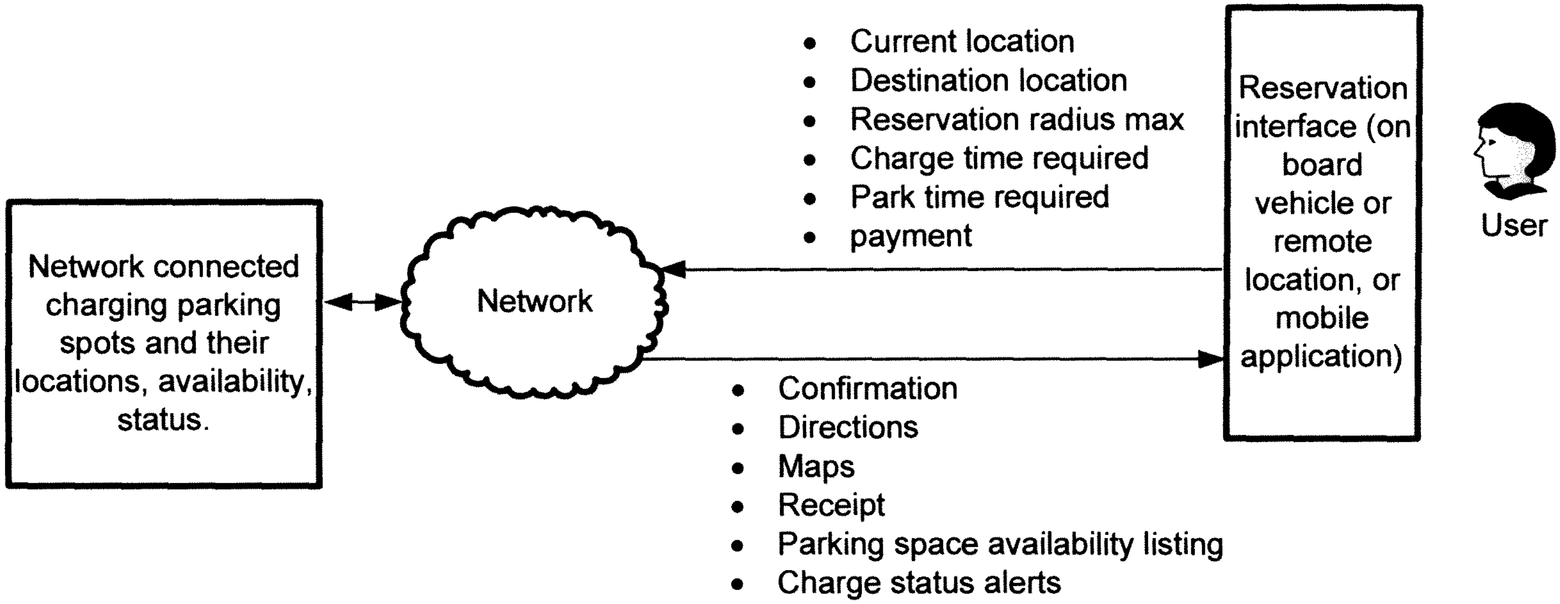

Network connected charging parking spots and their locations, availability, status.
Network
• Current location
• Destination location
• Reservation radius max
• Charge time required
• Park time required
• payment
• Confirmation
• Directions
• Maps
• Receipt
• Parking space availability listing
• Charge status alerts
Reservation interface (on board vehicle or remote location, or mobile application)
User

FIG. 5

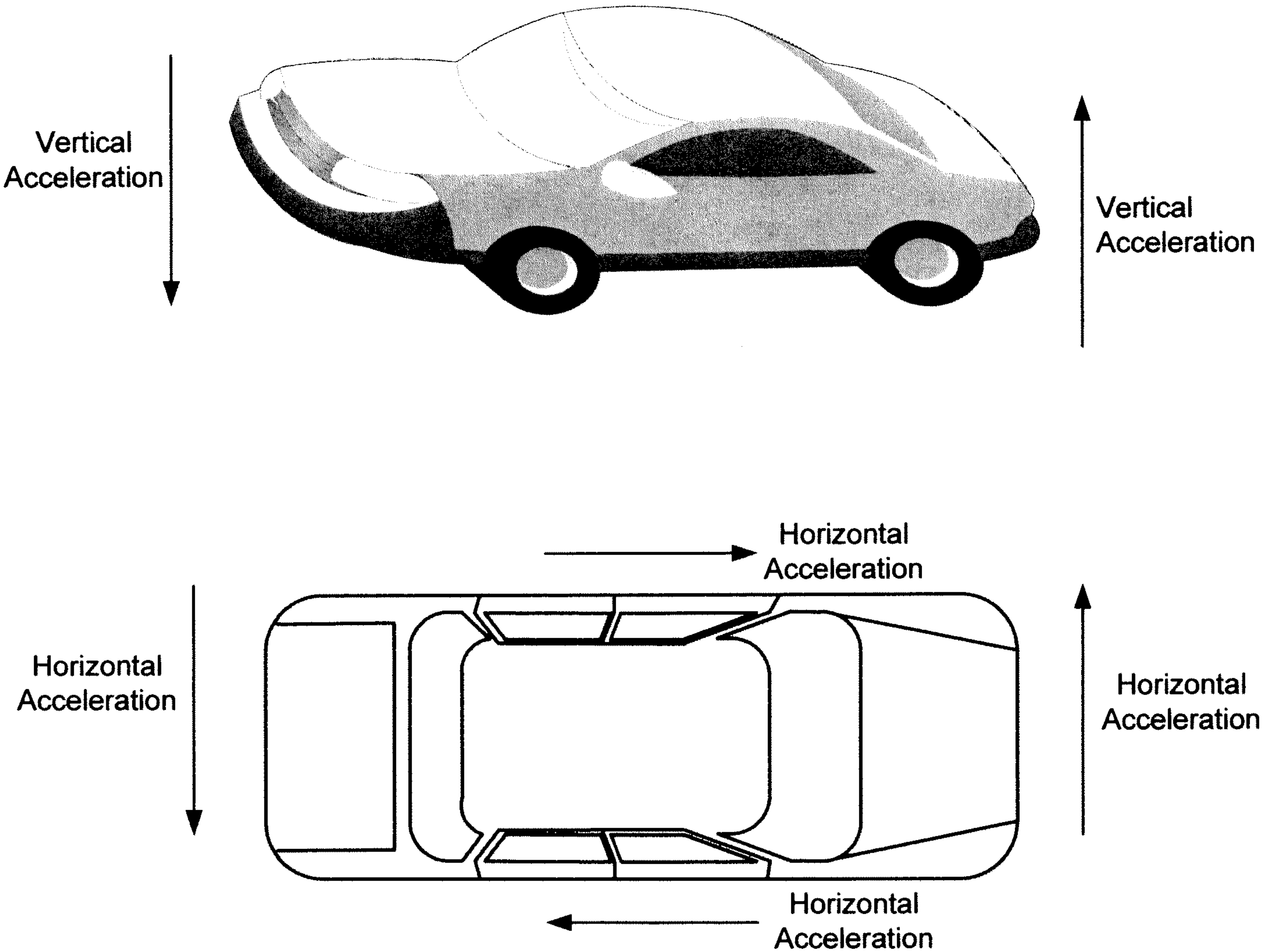

Vertical
Acceleration
Vertical
Acceleration
Horizontal
Acceleration
Horizontal
Acceleration
Horizontal
Acceleration
Horizontal
Acceleration

FIG. 1

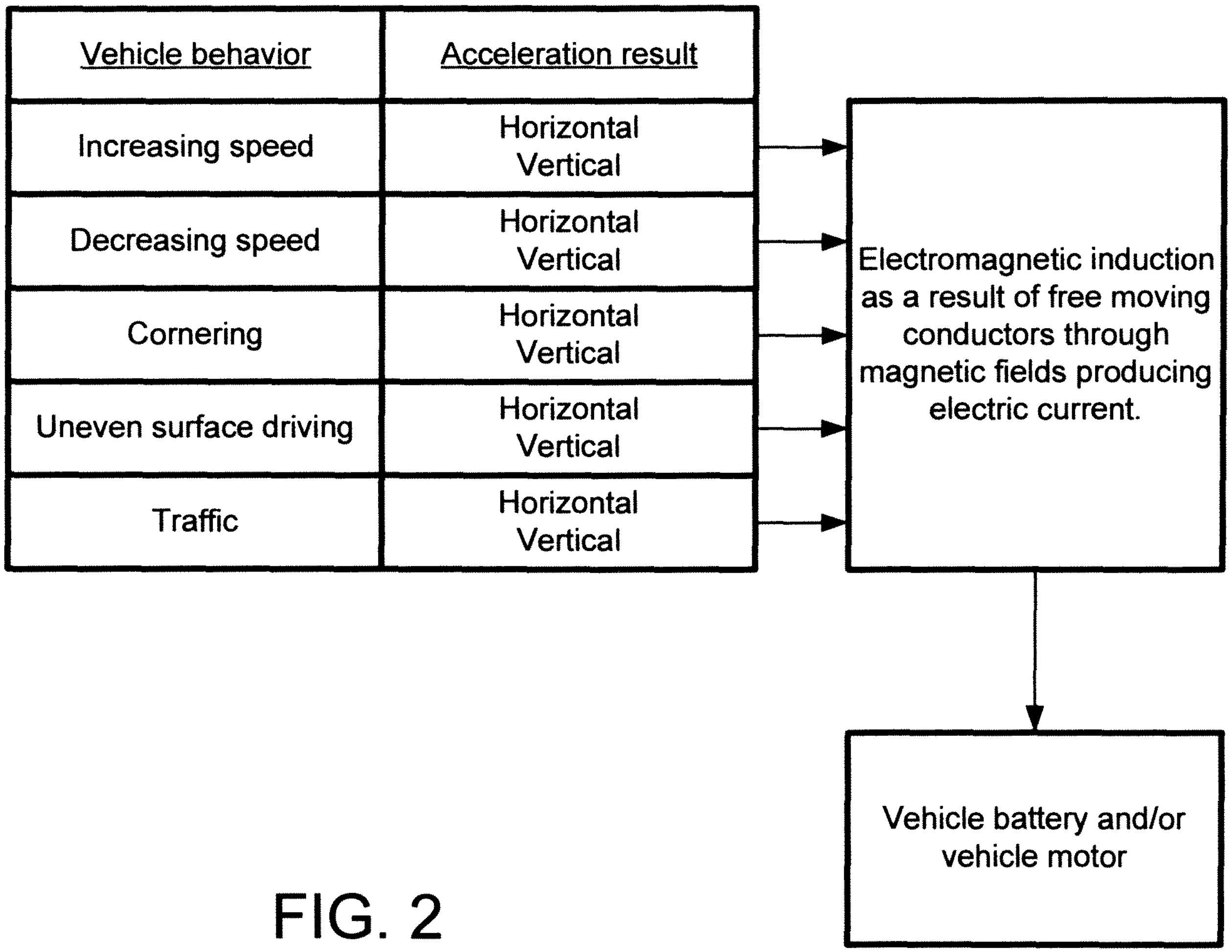

Vehicle behavior
Acceleration result
Increasing speed
Horizontal
Vertical
Decreasing speed
Horizontal
Vertical
Cornering
Horizontal
Vertical
Uneven surface driving
Horizontal
Vertical
Traffic
Horizontal
Vertical
Electromagnetic induction as a result of free moving conductors through magnetic fields producing electric current.
Vehicle battery and/or vehicle motor

FIG. 2

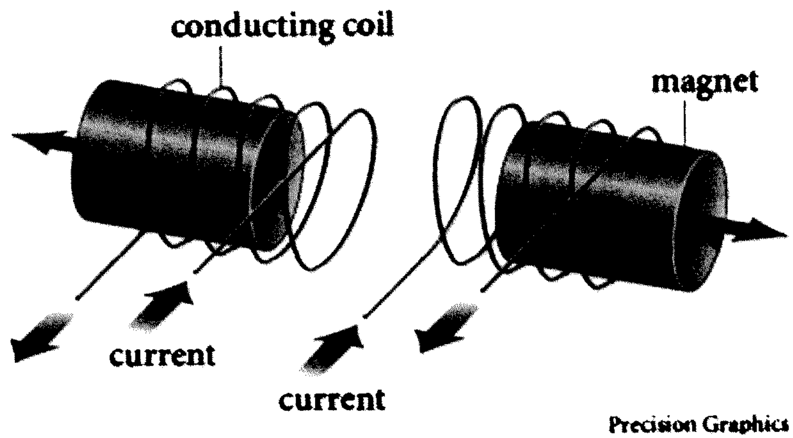

conducting coil
magnet
current
current
Precision Graphics

FIG. 3

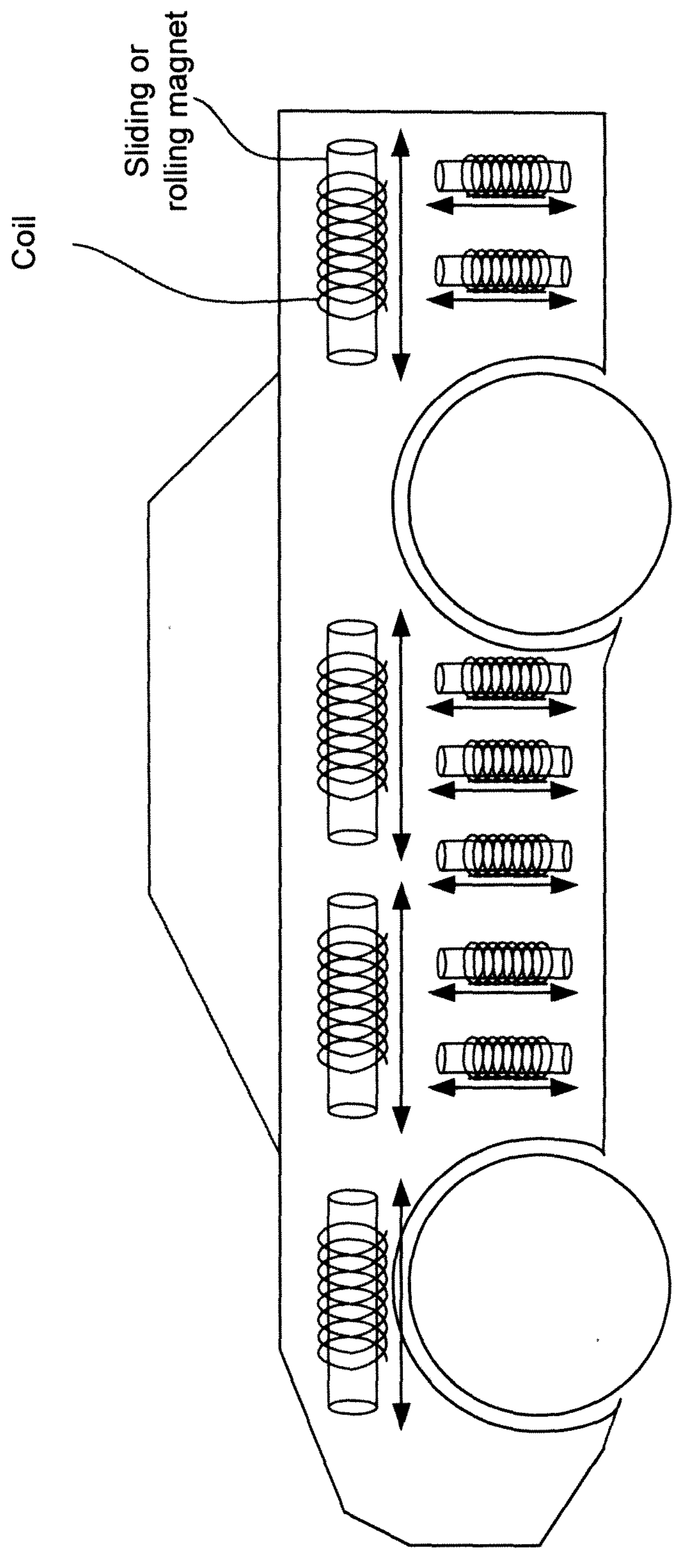


FIG. 4

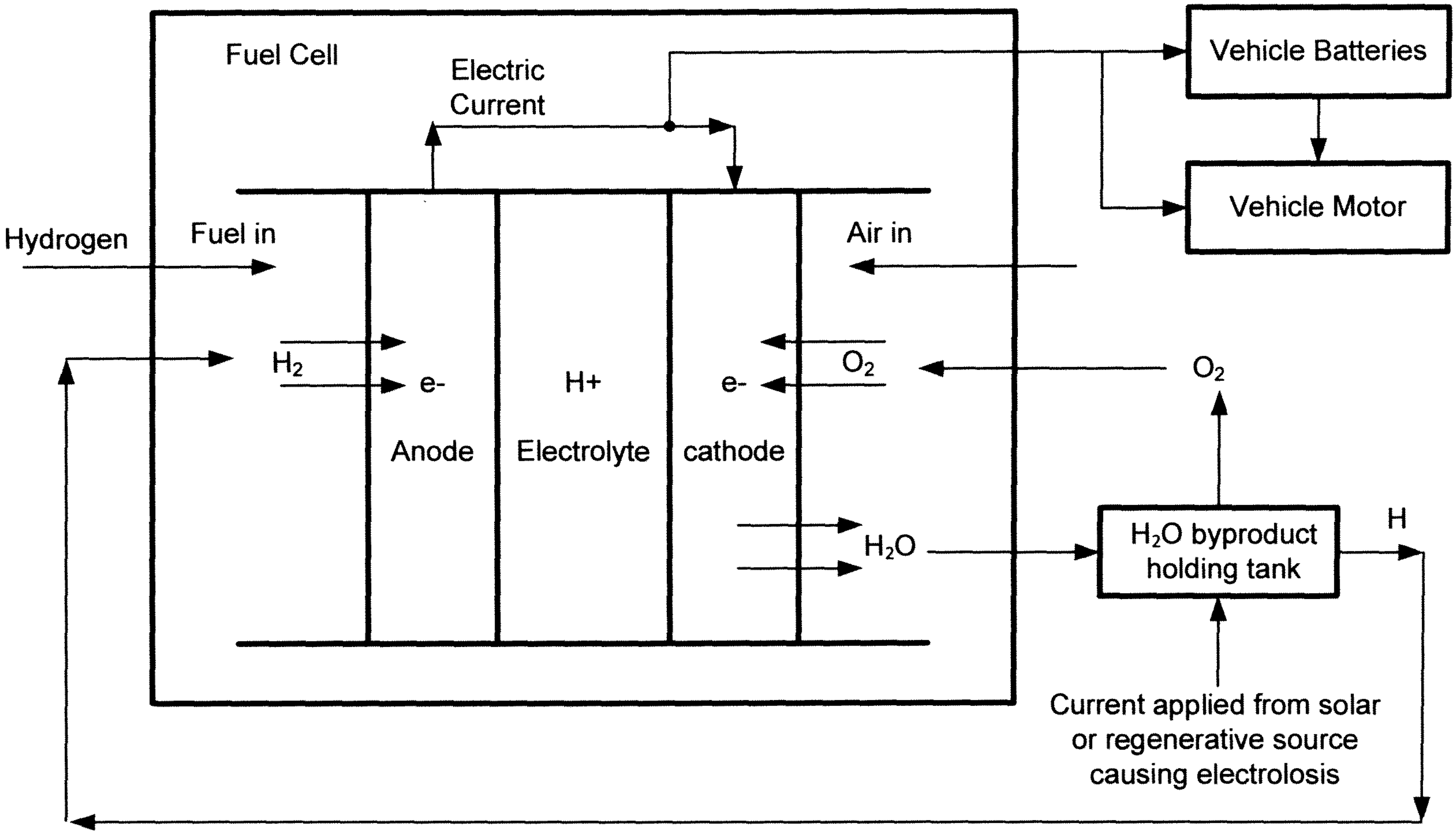

Fuel Cell
Electric Current
Vehicle Batteries
Vehicle Motor
Hydrogen
Fuel in
Air in
H2
e-
H+
e-
O2
O2
Anode
Electrolyte
cathode
H2O
H2O byproduct holding tank
H
Current applied from solar or regenerative source causing electrolosis

FIG. 1

VOLTP023

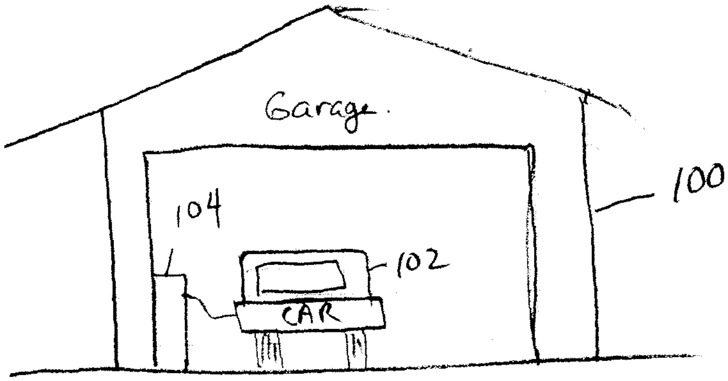


FIG. 1

[redacted]

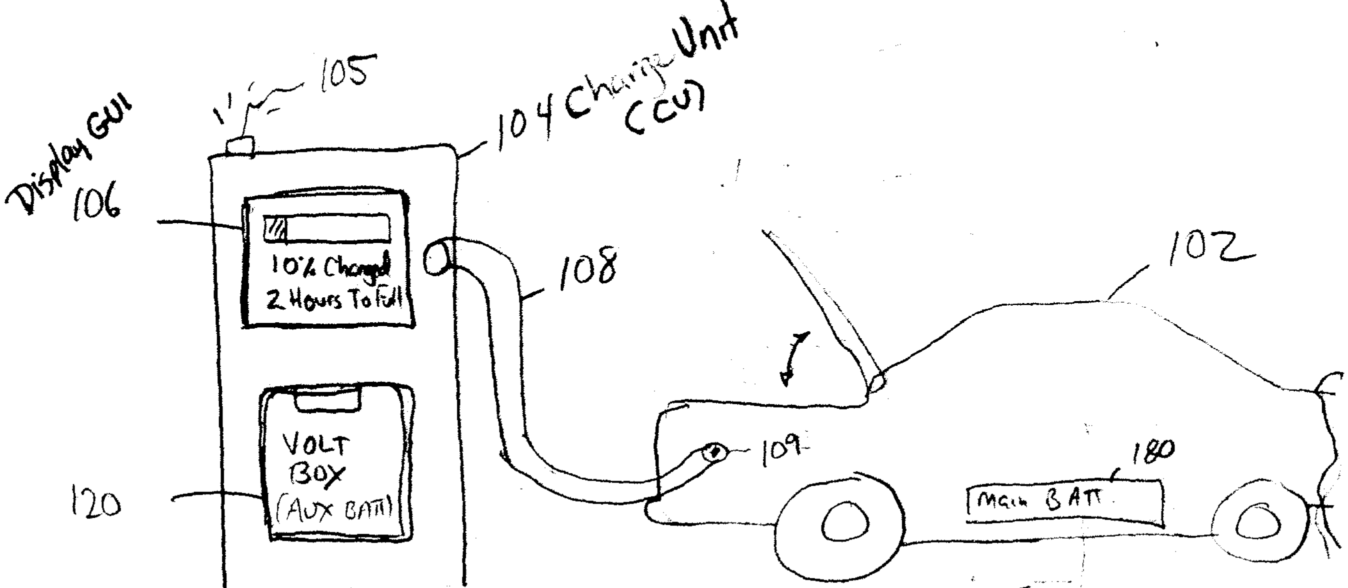


FIG. 2

[redacted]

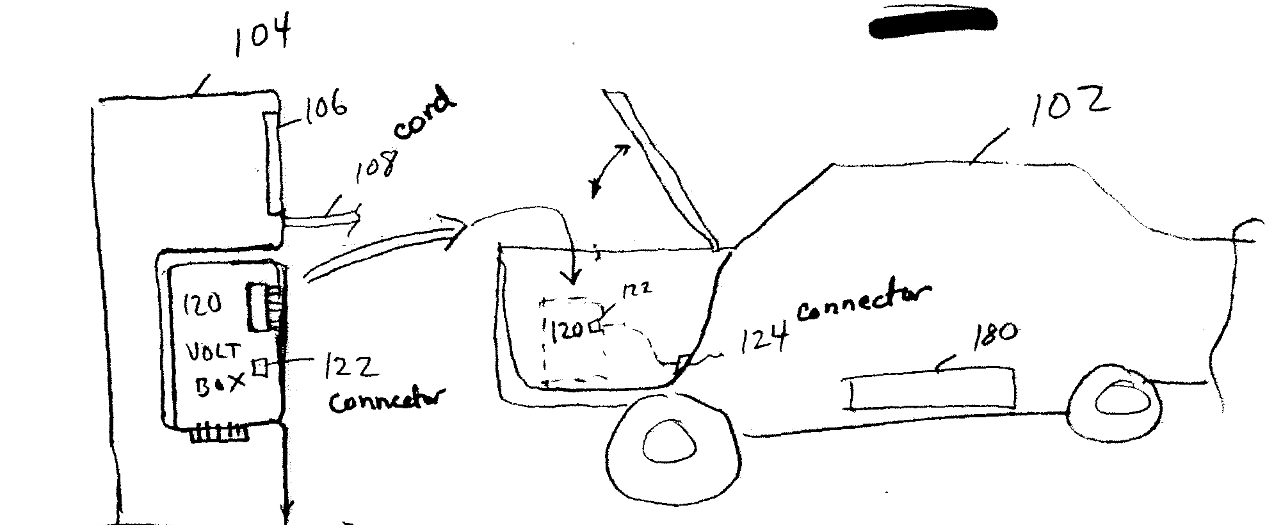


FIG. 3

[redacted]

VOLTP023

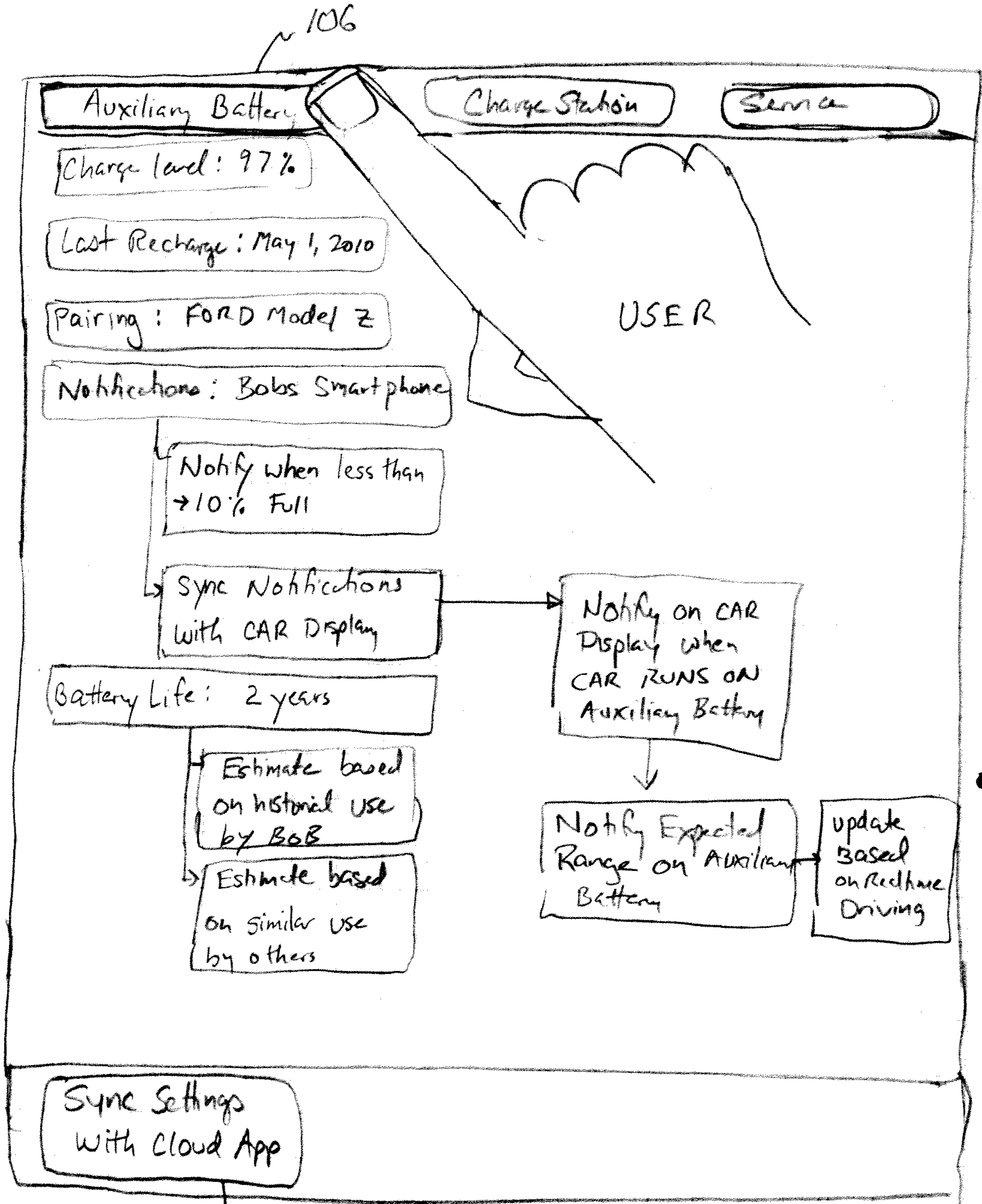


FIG. 4

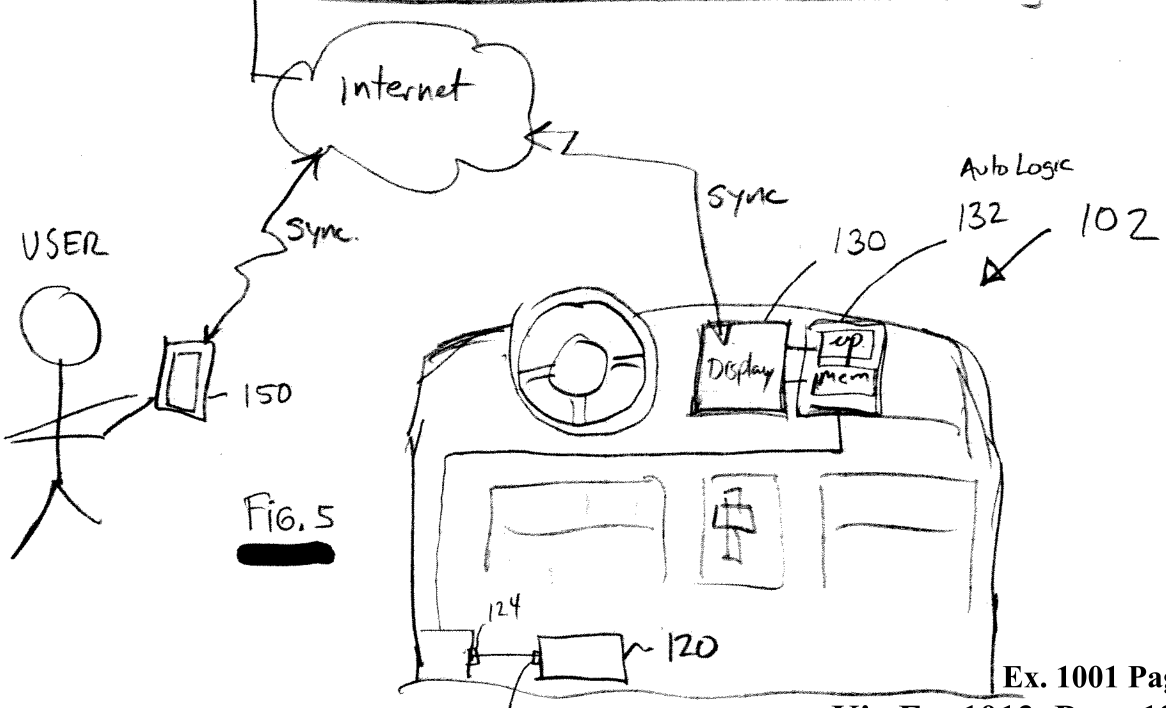


FIG. 5

VOLT P023

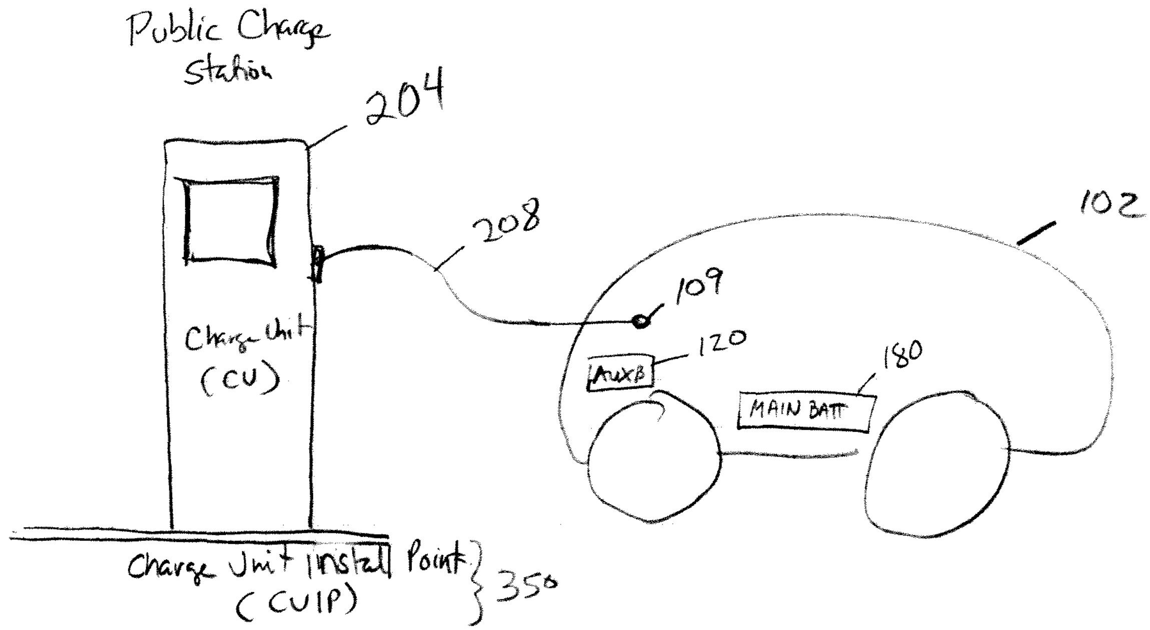


FIG. 6

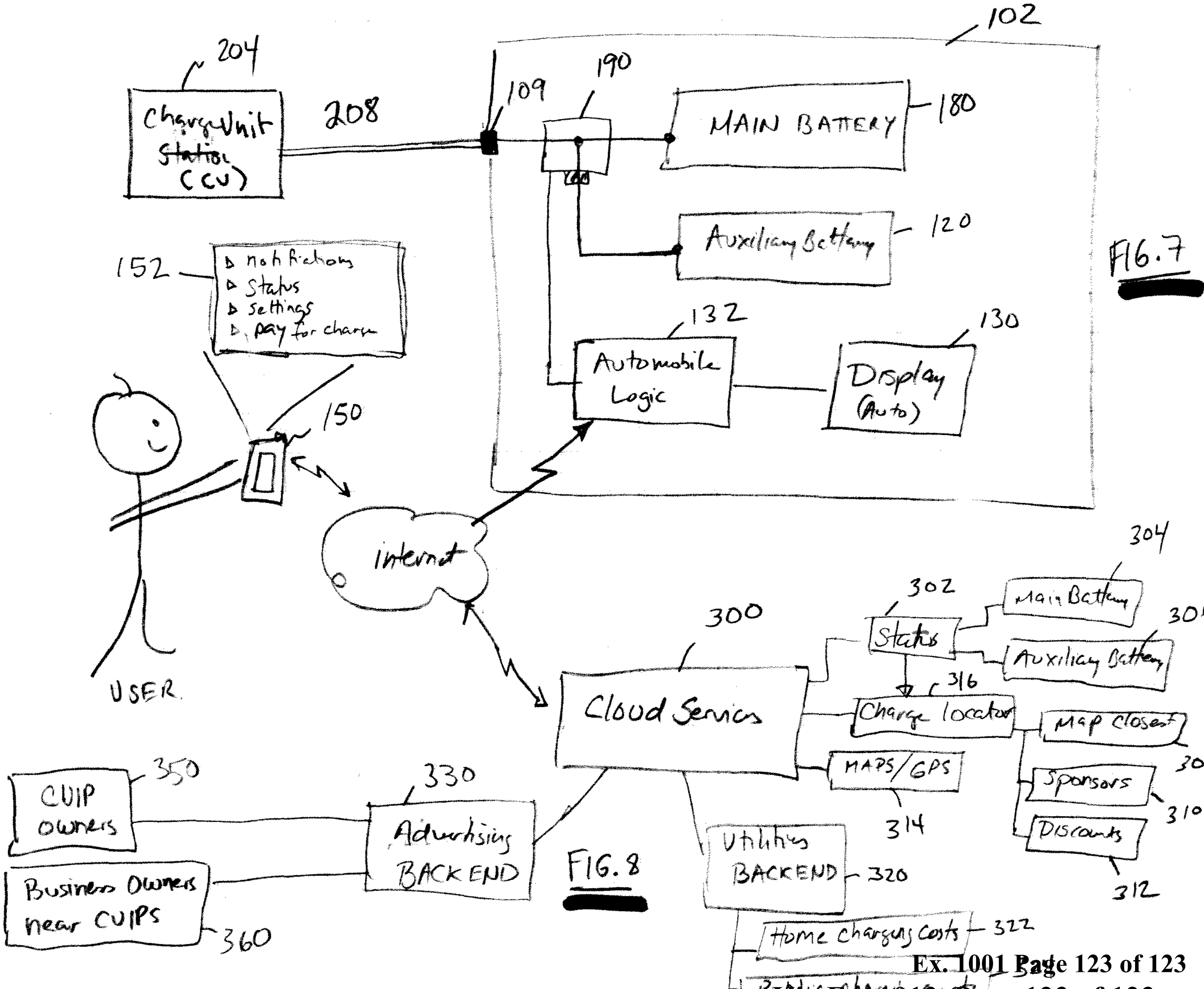


FIG. 7

FIG. 8