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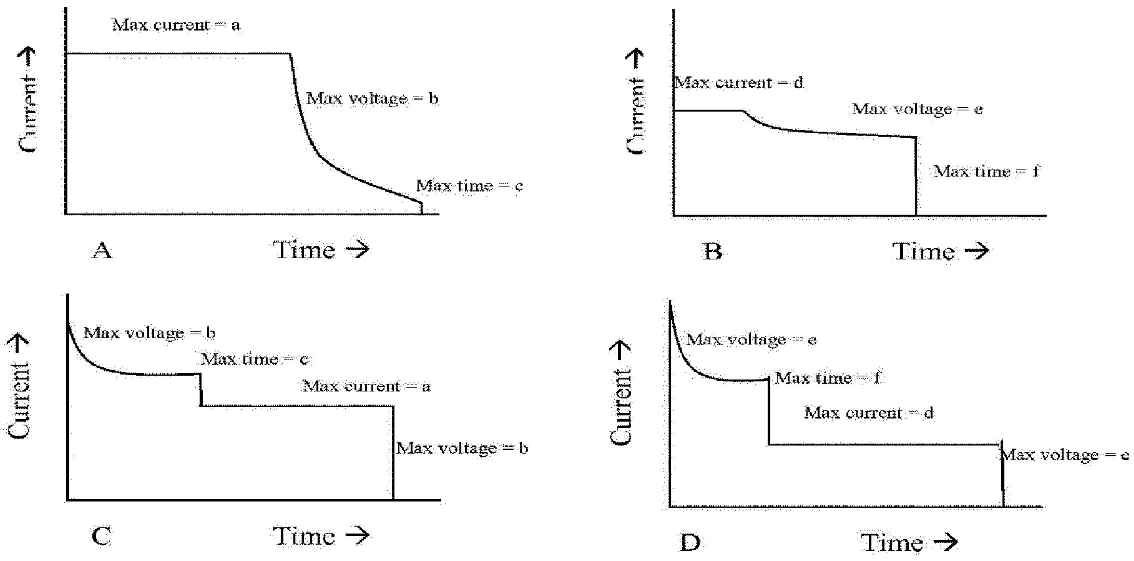
(54) Method, system and device for charging an electric vehicle.

(57) The present invention relates to a method for charging an electric vehicle, comprising the steps of determining a suitable charge algorithm for charging the electric vehicle, providing the charger with the algorithm and charging the electric vehicle according to the algorithm. The invention further relates to a charger for an electric vehicle, configured to have an updatable charging algorithm set, and in particular a charger configured for receiving and executing charging algorithms in the form of an executable script. Parameters for the charging algorithm may be received from a different source than the algorithm.



NL C 2005816

Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

Method, system and device for charging an electric vehicle

The present invention relates to a method, system and device for charging an electric vehicle, in particular an on-board battery thereof. It is well known to charge batteries of electric vehicles with the aid of chargers, and also to make use of charging algorithms, that prescribe charging currents and voltages as a function of time and other parameters. Some chargers even offer the possibility to choose between multiple charging algorithms that are optimised for different situations or batteries.

However, these optimisations are done upfront, in particular when the charger is manufactured. This has several disadvantages. The charger may not comprise optimal algorithms for the actual situations it is used in, or the situation and circumstances may change, or better algorithms may be developed after manufacture of the charger.

It is a goal of the present invention to provide a solution for the above-mentioned disadvantages. In general, it is a further goal of the present invention to provide a useful alternative to methods, systems and devices for charging electric vehicles according to the art.

The invention thereto proposes a method for charging an electric vehicle, comprising the steps of determining a suitable charge and/or decision algorithm for charging the electric vehicle, providing the charger and/or the vehicle with the algorithm, and charging the electric vehicle according to the algorithm.

Here, a charge algorithm is to be understood as a procedure that controls the charging operation of the charger dependent on charge parameters like voltage, current, time and temperature. Example of a charge algorithm is charging with a constant current until a voltage threshold of the battery is reached, and then charging with a constant voltage during a predetermined time. Another algorithm could be pulsed charging. A decision algorithm is a procedure which determines the best charge algorithm and/or the charge parameters for a situation, dependent on decision parameters like grid power availability, requests or suggestions by the electric vehicle, price and demand on other charging ports or charging ports on other chargers in the vicinity the of the actual charger.

The charger may be a direct current charger, an alternating current charge, an inductive charger or any combination thereof. According to the present invention, the charger and and in some specific embodiments also the electric vehicle should be adapted to be able to receive algorithms, and store algorithms locally. An updatable and/or accessible memory or data storage means should thereto be available. It is preferred that the charger and the electric vehicle comprise communication means via which the algorithms and parameters can be provided. These communication means can be wireless means, or wired means, for example integrated in a cable for charging an electric vehicle. The protocol that is used for the interaction between the server, charger and the electric vehicle may be adapted for sending and receiving algorithms.

The present invention herewith provides the advantage that algorithms can be updated or replaced remotely. A charger can be upgraded with the latest charge algorithms. An electric vehicle can also be upgraded with latest charge algorithms, which can then use these optimal algorithms when charging at more primitive charging stations. In the end, an extended battery life may be the goal of the invention.

In an embodiment, the method comprises providing the charger and/or the electric vehicle with parameters for use with the algorithm. These parameters may for example be maximum currents or voltages of the battery and/or vehicle, or parameters relating to the grid or to other electric vehicles at the charging location.

It is also possible that parameters are embedded in the algorithms, and uploaded to the charger and/or electric vehicle along with the algorithm. This is especially advantageous when the parameters are optimised parameters for a specific algorithm.

It is also thinkable that the parameters are provided from a different location than the algorithm itself. For example, the algorithm is sent to the charger from a central database, while the parameters are derived from an onboard controller, memory or data storage of the electric vehicle.

In general, the method according to the present invention may comprise reading the algorithm and/or parameters from a database in a data-network that comprises the charger. This database may be a central database, on a server that is part of a network the charger forms part of too, or at least a network the charger can connect to.

In another embodiment, it is thinkable that the algorithm and/or parameters are read from a database or memory in the electric vehicle to be charged. For that purpose the method according to the invention may comprise the step of uploading algorithms into a controller of an electric vehicle, for controlling a charger that charges the electric vehicle. Thereto, a central server may comprise actual charging algorithms, which are sent via a data-connection of a charging station, when the electric vehicle is being charged at a charger that forms part of a network that also comprises the central server. It should be noted here that the term “central server” may also comprise multiple (interconnected) servers or databases, or cloud computing configurations.

In a further embodiment, the method may comprise providing the algorithm in the form of a computer readable script, wherein the electric vehicle is charged by executing the script in the controller, which is aboard a charger, or an electric vehicle. A charger and electric vehicle according to the invention is thereto configured to receive and execute charging algorithms in script form.

The algorithm may further comprise one or more decision algorithms based on external parameters such as grid power availability, requests or suggestions by the vehicle, price and demand on other charging ports of the same charger , or price or demand on charging ports of another charger.

In an embodiment the algorithm is transmitted in encrypted form to the vehicle, the decryption key can then be delivered separately via wired, wireless (GPRS) or manual means. The algorithm can also be forced to execute on the vehicle, for example in case of robbery the vehicle is forced to run a slow charging algorithm.

The charger as intended in the present invention can be a so-called DC charger where the charger comprises one or more converters which can convert AC power from the Grid to DC and feed this DC power directly into the vehicle. The algorithm may influence or control the power delivery of the AC-DC converter inside the charger (voltage, current) to generate a certain charge profile.

The charger can also be a AC charge system which supplies an AC current to the vehicles. In this case the vehicle will contain some kind of AC-DC conversion device. In this embodiment the algorithm may influence the power delivery of the AC-DC conversion device inside the vehicle to generate a certain charge profile.

In another embodiment the system may be a so-called inductive charge system, where the power is transferred via an inductive system. In this case, generally, the power is transferred via a power conversion system inside the charger and a first coil connected to the charger to a second coil which is part of the vehicle. In this case the algorithm may influence the power delivery of the power conversion system and first coil to generate a certain charge profile.

Resumingly, the invention provides the advantages that algorithms in the charger can be updated or changed remotely, that the controller aboard the vehicle can be upgraded with the latest algorithms and use these optimal algorithms when charging at more primitive chargers, extending the battery-life, and because of the memory in the charger, it can store a library of algorithms, preventing that the entire algorithm has to be transmitted every time a new vehicle is connected to the charger.

The invention will now be explained into more detail with reference to the following figures, wherein:

- Figure 1 shows a schematic view of a charging situation in the prior art;
- Figure 2a-2b shows the schematic view of two charging situations in the present invention..
- Figure 3 shows the schematic view of another charging situation in the present invention.
- Figure 4 shows a flowchart of a possible decision algorithm.
- Figure 5 shows a flowchart of a possible charge algorithm.
- Figure 6 shows another flowchart of a possible charge algorithm.
- Figure 7a-d shows graphs of four possible charge algorithms.

Figure 1 shows the prior art, a remote element embodied by a (central) server 1 which can contain algorithms for charging or decision-making, a charger 3 which receives parameters 2 from the server 1 and uses these parameters 2 to charge the electric vehicle 5. When a vehicle 5 connects to the charger 3, parameters 6 are exchanged between the charger 3 and the electric vehicle 5 before the charging starts and during the charging. The communication between the charger and vehicle is governed by the charging control protocol, which is a limiting factor in the transfer of data between the charger and the vehicle. One example could be the charge control protocol which to date allows only the transfer of parameters. The electric vehicle 5 may also receive parameters 8 via local input means.

Figure 2a shows an embodiment of the present invention, a remote element embodied by a (central) server 11 which can contain algorithms for charging or decision making, a charger 13 with modified firmware to receive or transmit algorithms 20 from the server 11 and uses these algorithms 20 with parameters 12 to charge the electric vehicle 15. In a more advanced configuration it is also possible to upload algorithms 22 from the charger 13 to an electric vehicle 15 with modified firmware to receive algorithms 22. Before the charging starts parameters 16 are exchanged between the charger 13 and the electric vehicle 15. The electric vehicle 15 and the charger 13 may also receive parameters (14, 18) via local input means.

Figure 2b shows a case wherein the electric vehicle 55 has received an algorithm in an earlier charge session (for example from charger 33 in figure 2a of the previous example). This algorithm stored in the vehicle can now be used to control the charger 53 it is connected to, or any other charger from a third party which is configured to allow the electric vehicle to take control over the charging process. Before the charging starts parameters 56 are exchanged between the charger 53 and the electric vehicle 55. The electric vehicle 55 and the charger 53 may also receive parameters 58 via local input means. This concept can also be applied to other decision-taking moments or entities in chargers, such as deciding whether maintenance is necessary and calling for it.

Figure 3 shows a case wherein it is not only possible to send parameters 32 and/or algorithms 30 from the server 31 to the charger 33 and charger 33 to the electric vehicle 35, but also from the electric vehicle 35 to the charger 33 and from the charger 33 to the server 31, or parameters 34 from a local infrastructure to the charger 33. Furthermore, parameters 36 and algorithms 42 may be exchanged between the charger 33 and the electric vehicle.

In an embodiment the algorithms can be sent to the electric vehicle 35 or to the server 31 (e.g. or auxiliaries) as a piece of (preferably executable) code (e.g. complete charger software, a patch) for example binary code, Java, Java byte code, C-code, a Library, or a programming language or language derived from a programming language. The algorithm can also be a script, for example a linear script with jumps.

The algorithm can be a finite state machine that is defined by a set of numbers, and/or it can be executed or interpreted on the fly or compiled to another form that can be executed or interpreted. The algorithm may need an instruction set, such as “set charge current to value x”.

These charge parameters like “value x” can be embedded in the algorithm. For example parameters that define a safe operation area can be part of the algorithm, rather of the charge parameter set that is used in combination with the charge algorithm. A benefit hereof is that the safety is maintained even if the script encounters an error such as a deadlock, undefined state of infinite loop..

The algorithm can also include functions or an extended instruction set that helps to keep the algorithm itself universal. For example, the maximum cell voltage from a battery pack can be provided by the battery pack itself or it can be that the battery pack provides all cell voltages and the charger needs to search the highest value in that array to get the highest cell voltage. This can be done in the script, but also in a different section, which cleans up the charge algorithm from such auxiliary functions.

The control of certain charge parameters can be a challenge. Some control needs to be fast, such as reacting on a high voltage, whereas other control can be slow such as reacting on temperature. It can be that these different types of control are in the charge script, but also it can be that they are in different locations. For instance a constant voltage algorithm can be a part of the charger, so that a charger can be directly controlled on voltage, but it can also be a part of the aforementioned globals, instruction set or functions header. It can be that a certain control is spread over these locations. For example a control can have a small and large control loop. The small control loop (e.g. keeping the current within a margin of a set value) can be part of the charger, whereas the large control loop (e.g. changing the current-set value as a function of the temperature) can be in the script in the electric vehicle.

The charge algorithm can be rule based, which means that the relation of the charge parameters is given in the algorithm file (logic programming). This method requires a solver that solves the equations to get to the correct result.

In an embodiment the electric vehicle 35 has decision algorithms on how to control the charging process (i.e. charge algorithm), which can be updated from the charger or through the charger from the remote server. The charger 33 has decision algorithms on how much power is available based on grid availability, requests or suggestions by the vehicle, price and demand on other charging ports or charge ports at charge stations in the vicinity of this charger. Between the charger 33 and the vehicle 35 there is a negotiation process that can be handled by the decision algorithms in the charger and the vehicle.

Figure 4 shows a flowchart of a possible decision algorithm that could be used within the present invention. The algorithm illustrated in figure 4 may be implemented in hardware, software or firmware or a combination thereof. In step S1 the charger determines if one or more vehicles are connected to the charger. If vehicles are connected to the charger, the battery data is determined in step S2. Next, in step S3 the maximum available grid power is determined. In step S4 the available grid power is compared with the total power demanded by the vehicles. If the available grid power is lesser than the total power demanded by the vehicles, the control moves to S5 and charge algorithm A is executed. Else control moves to step S6 and charge algorithm B is executed.

Figure 5 shows a flowchart of a possible charge algorithm that could be used within the present invention. The flowchart is explained in the following with reference to the waveforms of figures 7A-7B.

[Step S11] The charger starts charging the vehicle with a constant current (given by Ia and Id in figures 7A-7B). Control moves to the next step unconditionally.

[Step S12] While the charging with constant current is continuing, the elapsed time is compared with the set maximum charge time (given by tc and tf in figures 7A-7B). If the elapsed time is greater than or equal to the maximum charge time, the control moves to step S18 and the total charging process is terminated. Else the control moves to the next step.

[Step S13] The battery voltage is measured. Control moves to the next step unconditionally.

[Step S14] The battery voltage is compared with the set maximum voltage (given by Vb and Ve in figures 7A-7B). If the battery voltage is greater than or equal to the threshold voltage the control moves to the next step, else the control loops to step S12.

[Step S15] Constant current charging is terminated. Control moves to the next step unconditionally.

[Step S16] The charger starts charging the vehicle with the set maximum voltage (given by Vb and Ve in figures 7A-7B). Control moves to the next step unconditionally.

[Step S17] The charger continues charging the vehicle with the set maximum voltage until the maximum charge time (given by tc and tf in figures 7A-7B) has elapsed. The control moves then to the next step.

[Step S18] The total charging process is terminated.

Figure 6 shows another flowchart of a possible charge algorithm that could be used within the present invention. The flowchart is explained in the following with reference to the waveforms of figures 7C-7D.

[Step S21] The charger starts charging the vehicle with a constant voltage (given by Vb and Ve in figures 7C-7D). Control moves to the next step unconditionally.

[Step S22] The charger continues charging the vehicle with constant voltage until the maximum charge time (given by tc and tf in figures 7C-7D) has elapsed. The control moves then to the next step.

[Step S23] Constant voltage charging is terminated. Control moves to the next step unconditionally.
[Step S24] The charger starts charging the vehicle with a constant current (given by Ia and Id in figures 7C-7D). Control moves to the next step unconditionally.

[Step S25] The battery voltage is measured. Control moves to the next step unconditionally.

[Step S26] The battery voltage is compared with the set maximum voltage (given by Vb and Ve in figures 7C-7D). If the battery voltage is greater than or equal to the threshold voltage the control moves to the next step, else the control loops to step S25.

[Step S27] The total charging process is terminated.

Figure 7 shows four possible charge algorithms that could be used within the present invention. The graphs are to illustrate the idea, and are not on scale compared to each other.

In situation A, a charge algorithm is combined with a set of charge parameters. In this case, the charge algorithm describes that the battery current is limited to Max current, the Voltage is limted to Max Voltage and the time of the charging is limited to Max time. The parameters a, b and c are used in combination with this charge algorithm resulting in a current profile for the charging of the battery as shown in the figure of situation A: The battery charges at its maximum current until the maximum voltage is reached, then the current drops to maintain the maximum voltage until the time limit is reached and the charging is finished.

In situation B, the same charge algorithm is used, but with different charge parameters: d, e and f. The charging profile is different because of the different parameters.

In situation C, we show a different charging algorithm. In this case the same parameters as situation A are used a,b,c. The algorithm states that the battery is charged at max voltage until max time is reached, then the battery is charged at max current. Charging is finished when the max voltage is reached. Although the same parameter values are used for situation C, the charging profile is also different from situation A.

Situation D shows a charge profile for the algorithm of situation C with the parameters of situation B.

These examples illustrate how updating an algorithm according to the present invention can influence the charging profile which occurs under given conditions.

Conclusies

1. Werkwijze voor het opladen van een elektrisch voertuig, omvattende:

A. Het betpalen van een geschikte laad en/of beslisalgoritme voor het laden van het elektrische voertuig;

Waarin

- een laadalgoritme een procedure omvat voor het besturen van een laadoperatie van een lader, afhankelijk van laadparameters zoals spanning, stroom, tijd en temperatuur, en;
- een beslisalgoritme een procedure omvat voor het bepalen van een geschikt laadalgoritme en/of laadparameters, afhankelijk van beschikbaar vermogen op het net, prijs, en/of vraag naar elektrisch vermogen;

B. Voorzien van de lader en/of het voertuig van het algoritme;

C. Laden van het elektrisch voertuig volgens het algoritme.

2. Werkwijze volgens conclusie 1, waarin stap B omvat:

B1. het voorzien van de lader met laadparameters voor gebruik met het algoritme.

3. Werkwijze volgens conclusie 2, waarin stap B omvat:

B2. Het voorzien van de parameters vanaf een verschillende locatie dan het algoritme.

4. Werkwijze volgens één der voorgaande conclusies, waarin stap B omvat:

B3. Het lezen van het algoritme en/of de parameters vanuit een database in een data-netwerk dat de lader omvat.

5. Werkwijze volgens één van de voorgaande conclusies, waarin stap B omvat:

B4. Het lezen van het algoritme en/of de parameters vanaf een databank of geheugen in het op te laden voertuig.

6.Werkwijze volgens conclusie 5, waarin stap B omvat:

B5. Het uploaden van algoritmen naar de besturing van een voertuig, voor gebruik door of samen met de lader die het voertuig laadt.

7. Werkwijze volgens één van de voorgaande conclusies, waarin stap B omvat:

B6. het voorzien van het algoritme in een vorm van een door een computer leesbaar script, en waarin stap C omvat:
C1. Het laden van het elektrische voertuig door het uitvoeren van het script door de lader.

8. Werkwijze volgens conclusie 6 of 7, waarbij het algoritme ontworpen is als een universeel algoritme, dat externe functies aanroept.

9. Werkwijze volgens conclusie 8, waarbij het algoritme meerdere lussen omvat, waarbij de lussen opgeslagen zijn op verschillende locaties, zoals een centrale databank en/of een zich in het voertuig bevindend geheugen.

10. Werkwijze volgens een van de voorgaande conclusies, waarbij stap A omvat:
- A1. Het toepassen van een laadalgoritme dat beslisregels omvat die gebaseerd zijn op externe parameters zoals beschikbaar vermogen op het elektriciteitsnet, verzoeken of suggesties van het voertuig, prijs en vraag op dezelfde laadpoorten van dezelfde lader, of prijs en vraag op andere laadpoorten van dezelfde of een andere lader.

11. Werkwijze volgens een van de voorgaande conclusies, waarbij, gedurende stap C, het algoritme de vermogensafgifte beïnvloedt van een vermogensomzetter die deel uitmaakt van de lader.

12. Werkwijze volgens één van de voorgaande conclusies, waarbij gedurende stap C het algoritme de vermogensafgifte van een vermogensomzetter die deel uitmaakt van het voertuig beïnvloedt.

13. Lader voor een elektrisch voertuig, ingericht voor het hebben van een hernieuwbare algoritmeset.

14. Lader volgens conclusie 13, waarbij de lader geconfigureerd is voor het ontvangen en uitvoeren van algoritmen in de vorm van een uitvoerbaar script.

15. Lader volgens conclusie 13 of 14, ingericht voor het ontvangen van parameters voor het laadalgoritme van een verschillende bron dan het algoritme.

16. Lader volgens conclusie 13, 14 of 15, omvattende een vermogensomzetter waarvan de vermogensomzetting gedurende stap C beïnvloed kan worden door het algoritme.

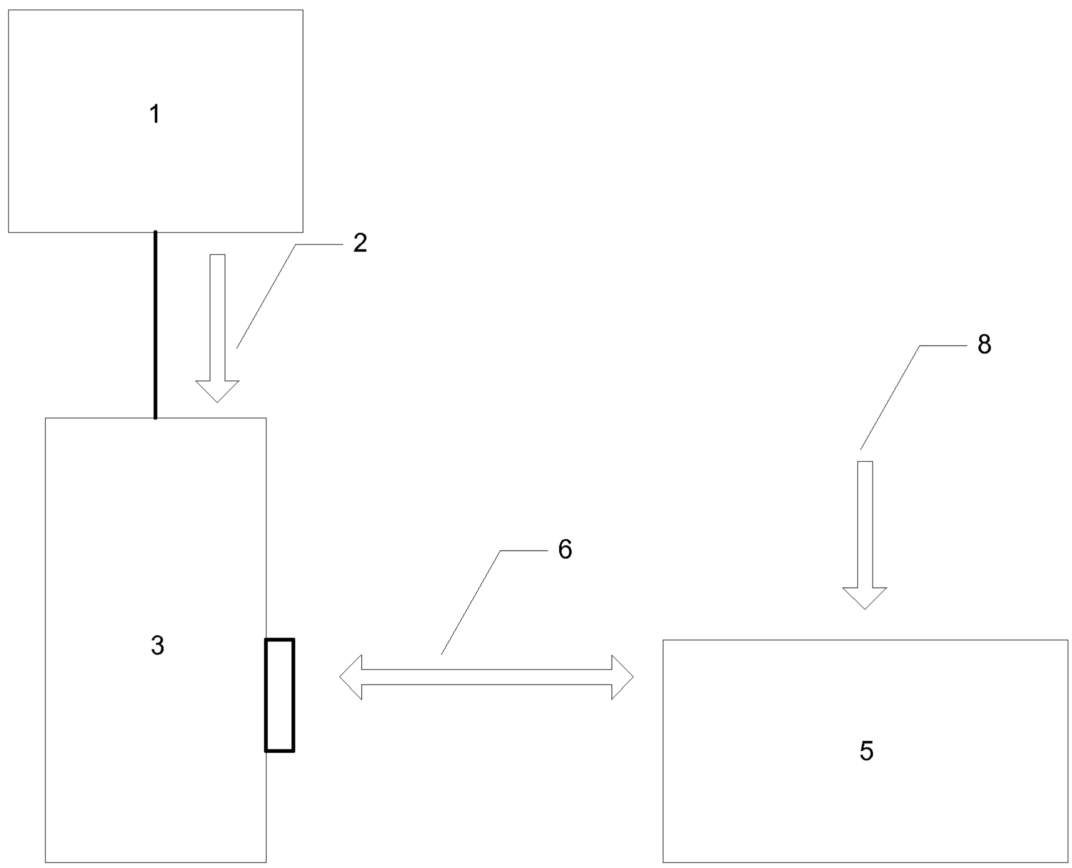


FIG. 1

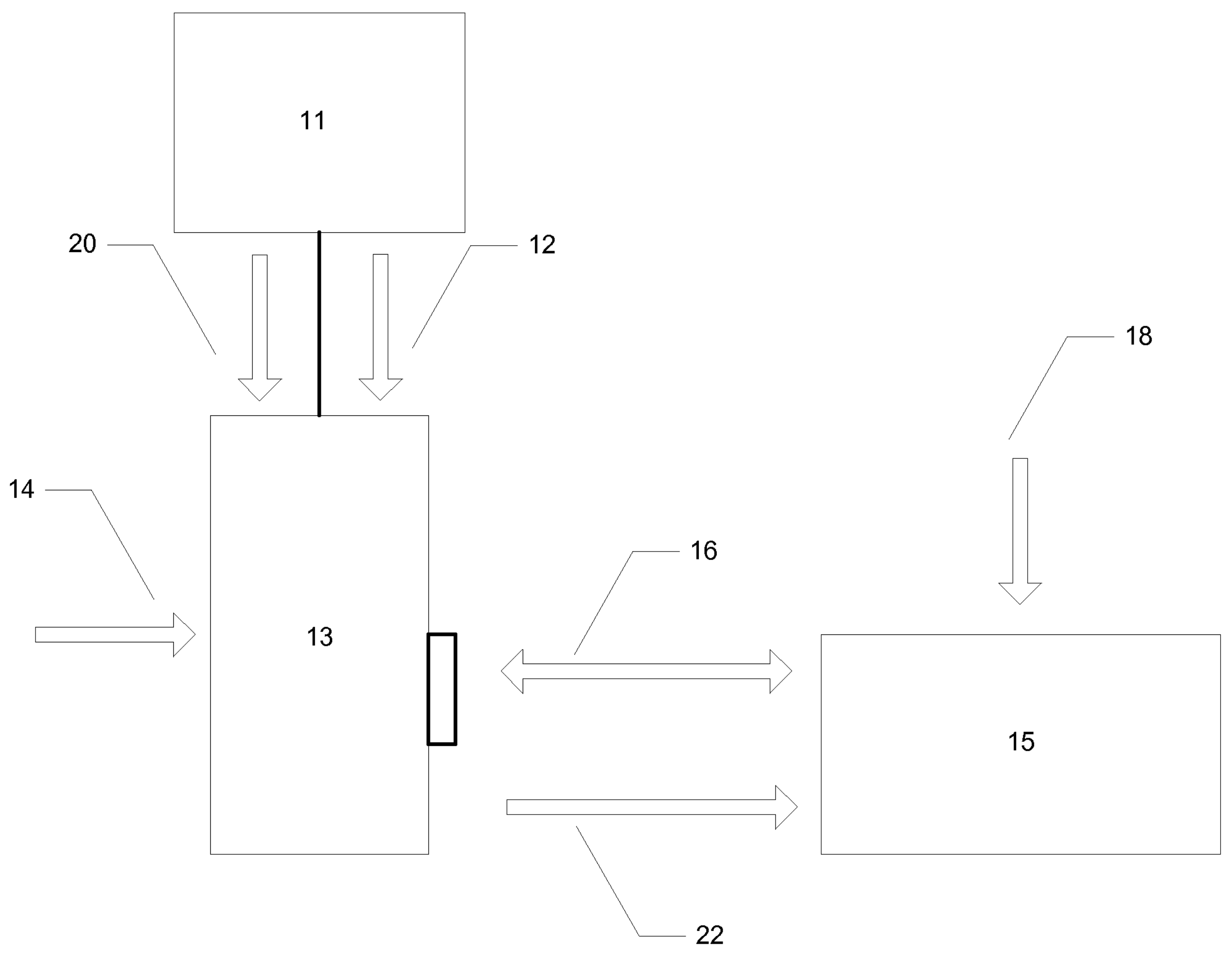


FIG. 2a

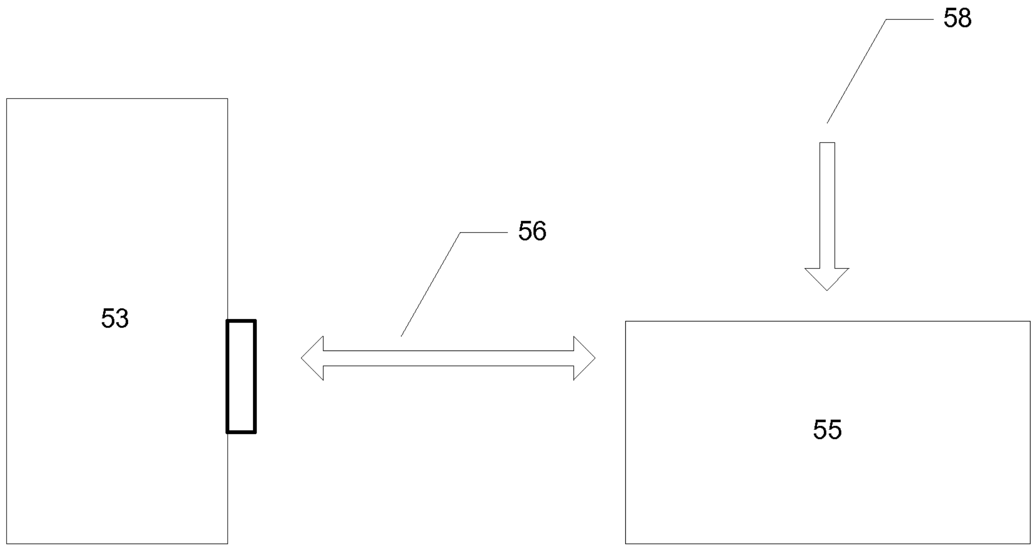


FIG. 2b

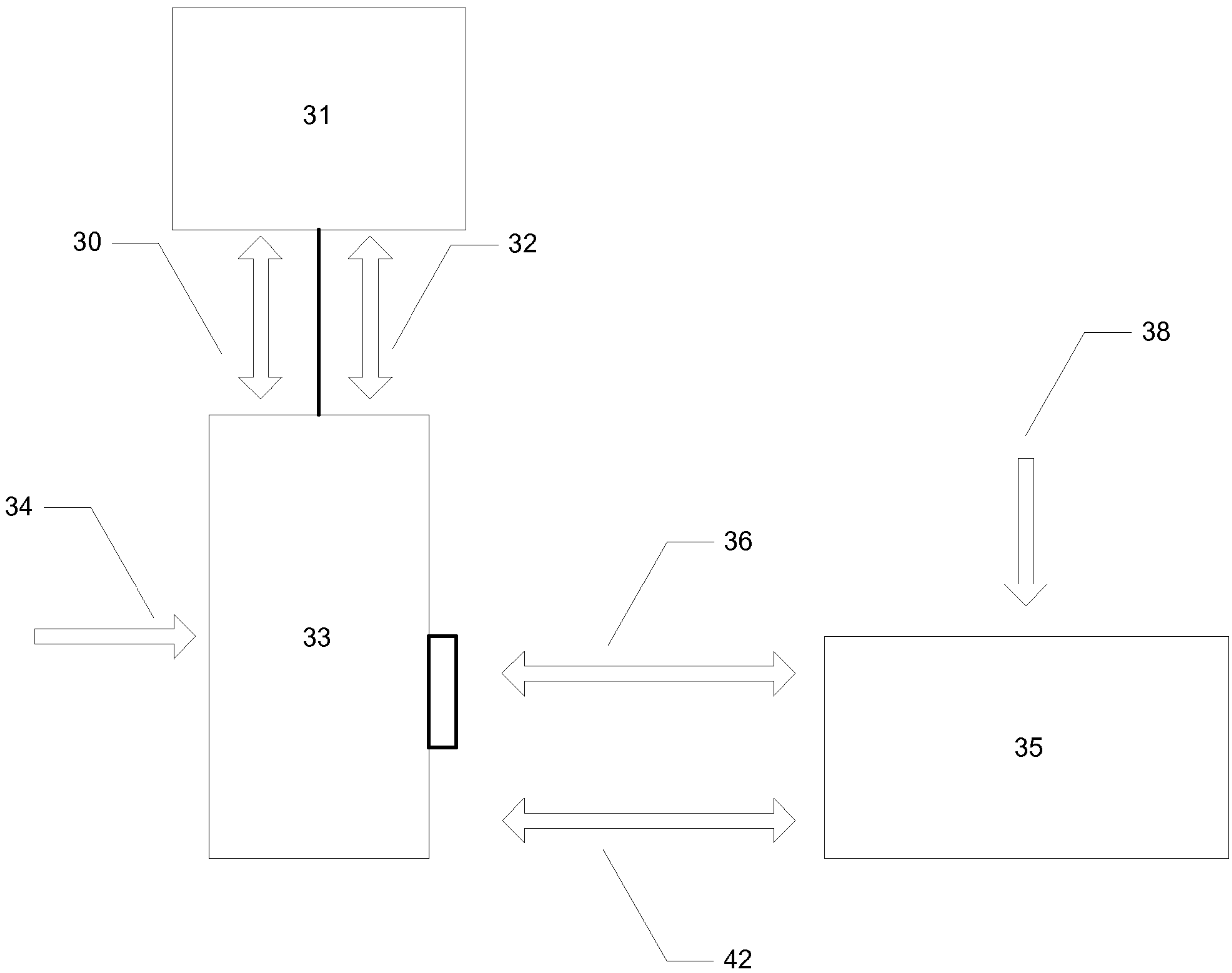


FIG. 3

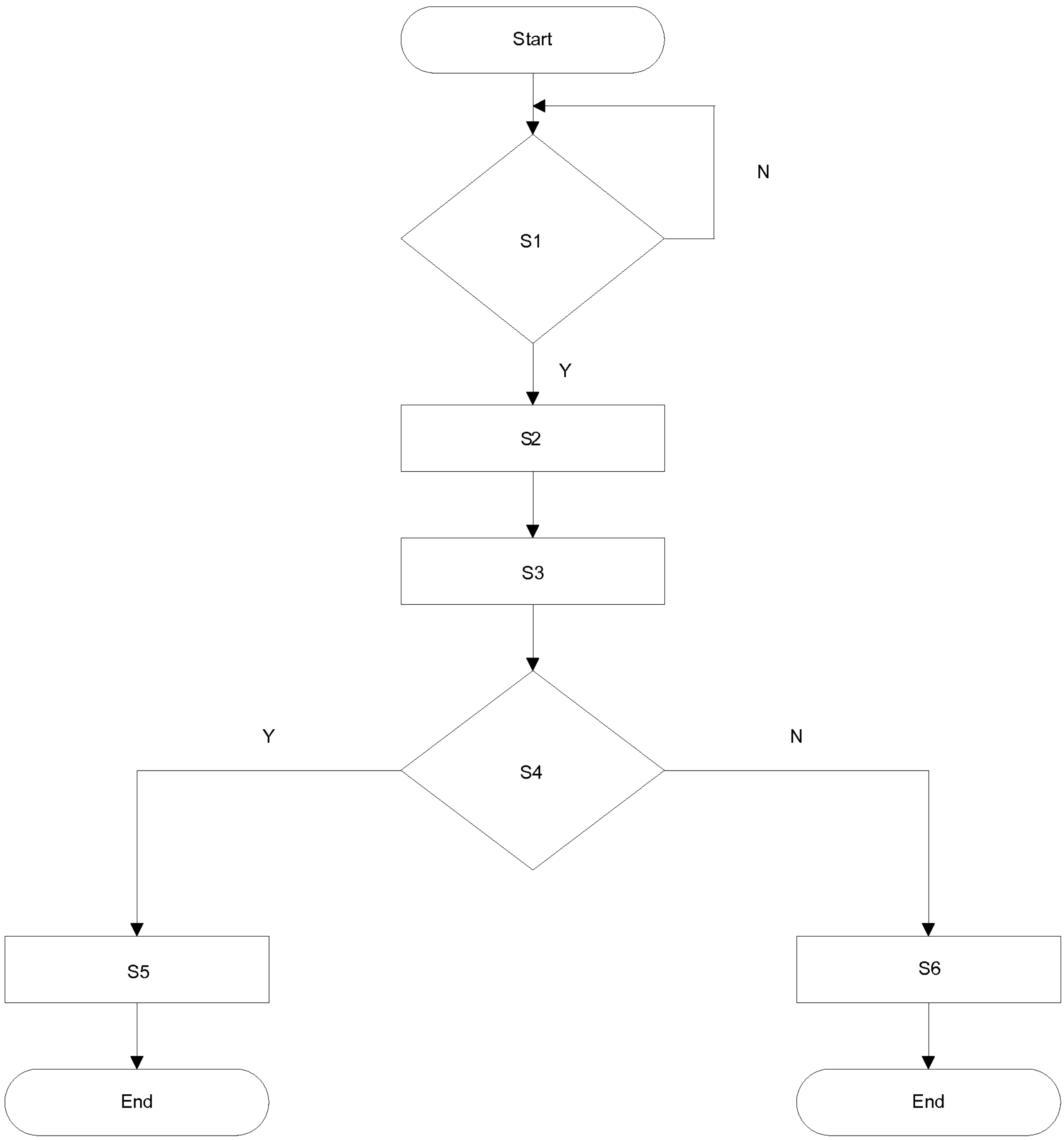


FIG. 4

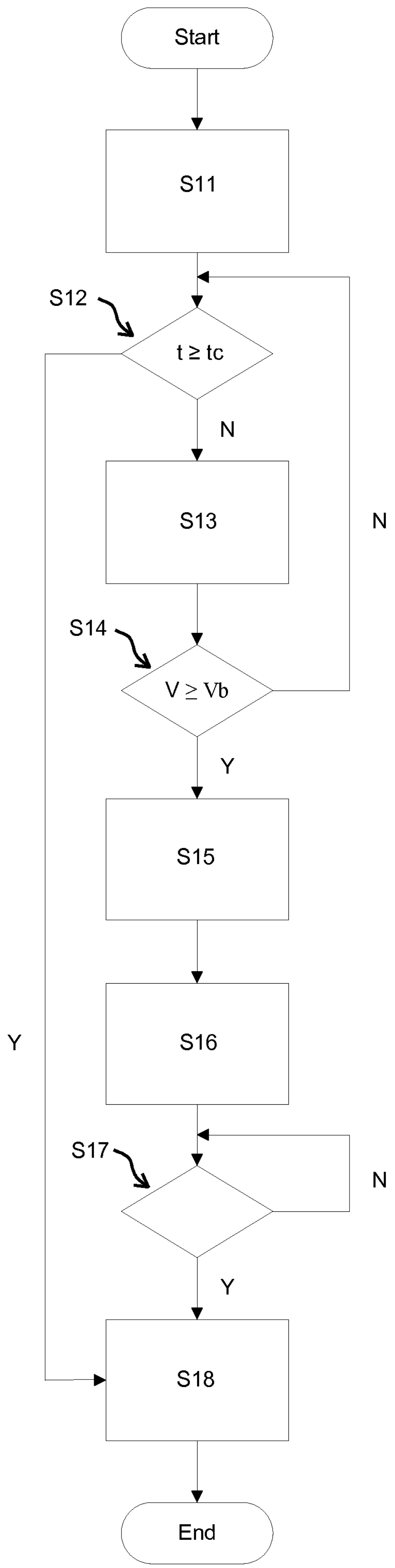


FIG. 5

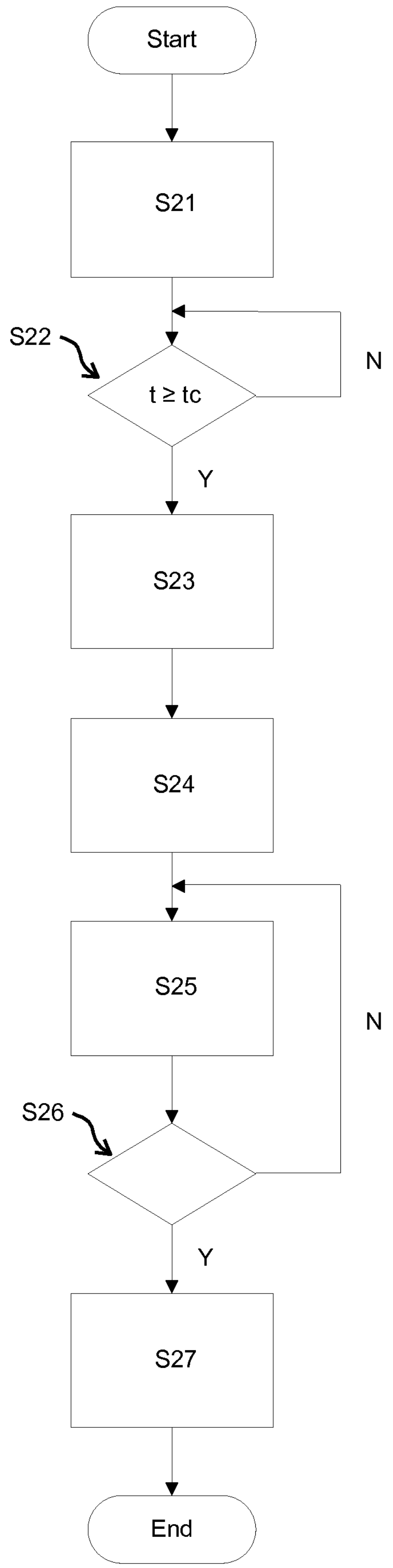
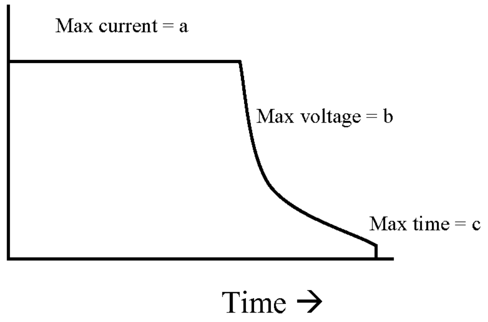
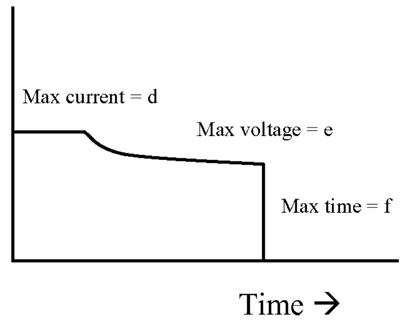


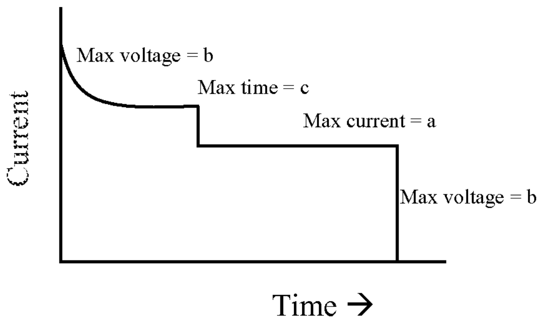
FIG. 6



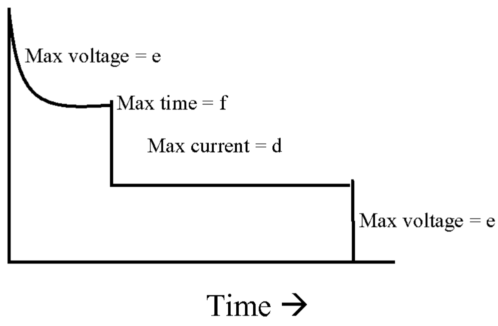
SITUATION A



SITUATION B



SITUATION C



SITUATION D

FIG. 7

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE **1.599.010 NL**
Nederlands aanvraag nr. **2005816**	Indieningsdatum **03-12-2010**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **EPYON B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **19-02-2011**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN 55688**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

B60L11/18 **H02J7/00** **H02J7/04**

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen	
IPC8	**H02J**	**B60L**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2005816

A. CLASSIFICATIE VAN HET ONDERWERP
INV. B60L11/18 H02J7/00 H02J7/04
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
H02J B60L

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)

EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X Y	EP 1 455 431 A2 (YAMAHA MOTOR CO LTD [JP]) 8 september 2004 (2004-09-08) * alineas [0001], [0018] - [0020], [0031], [0044]; figuren 1,7,8 *	1-3,5-9, 11-16 4,10
Y	US 2010/161482 A1 (LITTRELL NATHAN BOWMAN [US]) 24 juni 2010 (2010-06-24) * alinea [0025] *	4
Y	US 2008/079374 A1 (WOBBEN ALOYS [DE]) 3 april 2008 (2008-04-03) * alinea [0020] *	10
A	DE 10 2009 019753 A1 (DAIMLER CHRYSLER AG [DE]) 4 november 2010 (2010-11-04) * het gehele document *	1-16
	-/--	

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
28 juli 2011	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schürle, Patrick

1

Formulier PCT/ISA/201 (tweede blad) (Januari 2004)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2005816

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	DE 39 02 339 A1 (DETA AKKUMULATOREN [DE]; BENNING ELEKTROTECHNIK [DE] BENNING ELEKTROTE) 9 augustus 1990 (1990-08-09) * het gehele document * -----	1-16

1

Formulier PCT/ISA/201 (vervolg tweede blad) (Januari 2004)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek

NL 2005816

In het rapport genoemd octrooigeschrift		Datum van publicatie	Overeenkomend(e) geschrift(en)			Datum van publicatie
EP 1455431	A2	08-09-2004	CN	1531162	A	22-09-2004
			JP	2004274875	A	30-09-2004
			TW	I233720	B	01-06-2005
US 2010161482	A1	24-06-2010	WO	2010074856	A1	01-07-2010
US 2008079374	A1	03-04-2008	AU	2004259267	A1	03-02-2005
			BR	PI0412379	A	19-09-2006
			CA	2531139	A1	03-02-2005
			CN	1816463	A	09-08-2006
			DE	10331084	A1	24-03-2005
			EP	1646526	A1	19-04-2006
			EP	2319725	A2	11-05-2011
			WO	2005009779	A1	03-02-2005
			JP	2007534281	A	22-11-2007
			JP	2009089596	A	23-04-2009
			KR	20060038441	A	03-05-2006
			NZ	544537	A	29-10-2010
			US	2009206779	A1	20-08-2009
			US	2006244411	A1	02-11-2006
			ZA	200600340	A	29-11-2006
DE 102009019753	A1	04-11-2010	WO	2010127775	A2	11-11-2010
DE 3902339	A1	09-08-1990	GEEN			

OCTROOICENTRUM NEDERLAND

WRITTEN OPINION

File No. SN55688	Filing date *(day/month/year)* 03.12.2010	Priority date *(day/month/year)*	Application No. NL2005816
International Patent Classification (IPC) INV. B60L11/18 H02J7/00 H02J7/04			
Applicant Epyon B.V.			

This opinion contains indications relating to the following items:

- ☒ Box No. I — Basis of the opinion
- ☐ Box No. II — Priority
- ☐ Box No. III — Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV — Lack of unity of invention
- ☒ Box No. V — Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI — Certain documents cited
- ☒ Box No. VII — Certain defects in the application
- ☒ Box No. VIII — Certain observations on the application

	Examiner

Application number
NL2005816

WRITTEN OPINION

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	4, 10
	No:	Claims	1-3, 5-9, 11-16
Inventive step	Yes:	Claims	
	No:	Claims	1-16
Industrial applicability	Yes:	Claims	1-16
	No:	Claims	

2. Citations and explanations

   see separate sheet

WRITTEN OPINION

Box No. VII Certain defects in the application

see separate sheet

Box No. VIII Certain observations on the application

see separate sheet

Reference is made to the following documents:

D1 EP 1 455 431 A2 (YAMAHA MOTOR CO LTD [JP]) 8 september 2004 (2004-09-08)

D2 US 2010/161482 A1 (LITTRELL NATHAN BOWMAN [US]) 24 juni 2010 (2010-06-24)

D3 US 2008/079374 A1 (WOBBEN ALOYS [DE]) 3 april 2008 (2008-04-03)

Brief summary

It is not at present apparent which part of the application could meet the requirements of patentability.

Re Item V.

Independent claims

1 The present application does not meet the criteria of patentability, because the subject-matter of claim 1,13 is not new.

1.1 The document D1 discloses (the references in parentheses applying to this document):

A method for charging an electric vehicle ([0001]), comprising:

A. determining a suitable charge algorithm for charging the electric vehicle ([0018]); wherein

- a charge algorithm comprises a procedure for controlling a charging operation of a charger, dependent on charge parameters like voltage 271, current 327, time (implicit) and temperature 331 ([0019],[0020]);

B. Providing the charger 300 with the algorithm ([0018]);

C. Charging the electric vehicle according to the algorithm (fig.7,8).

2 The features of independent apparatus claim 13 are disclosed in D1 ([0031]).

Dependent claims

3 The lack of clarity notwithstanding (see Item VIII), dependent claims 2-12,14-16 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of novelty or inventive step.

3.1 The additional features introduced by dependent claims 2,3,15 are disclosed in D1 ([0031]).

3.2 The additional features introduced by dependent claim 4 are are disclosed in D2 ([0025]).

3.3 The additional features introduced by dependent claims 5,6 are disclosed in D1 ([0018]).

3.4 The additional features introduced by dependent claims 7,8,9,14 are implicitly disclosed in D1, because D1 discloses a CPU running with computer programmed algorithms.

3.5 The additional features introduced by dependent claim 10 are disclosed in D3 ([0020]).

3.6 The additional features introduced by dependent claims 11,12,16 are disclosed in D1 ([0044]; fig.1,7).

Re Item VII.

4 The application contains certain defects concerning form or content.

4.1 Independent claims 1,13 are not in the two-part-form.

4.2 The prior art (see documents above) is not identified in the description.

4.3 The features of the claims 1-16 are not provided with reference signs placed in parentheses.

Re Item VIII.

5 Claim 16 is unclear, because "step C" is not disclosed in claims 13-15.