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GB 2292271 A **EP 1251618 A2**

WO 2004/017472 A1 **DE 019727639 A1**

JP 100084637 A

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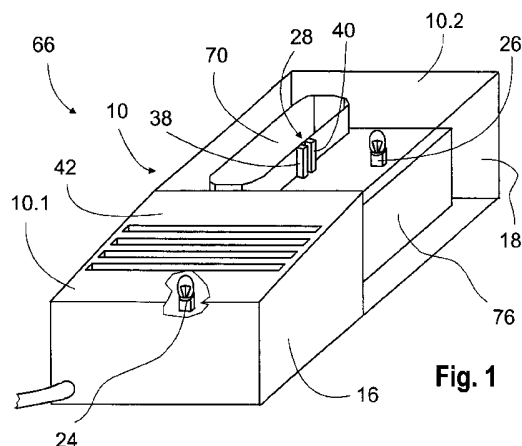
UK CL (Edition X) **H1R, H2H**

INT CL **H01M, H02J**

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(54) Abstract Title: **Battery charger having housing formed from light transmitting material**

(57) A charging unit (e.g. a battery charger) has at least one housing element 16, 18 which is formed at least partially by a light transmissive material. A lighting unit 24, 26 may be provided in the housing to transmit charging process information and may be formed at least partially from a light guide 38, 40. The lighting unit may also comprise at least one means formed at least partially by a light effect material e.g. a photoluminescent, fluorescent, phosphorescent or electroluminescent material.



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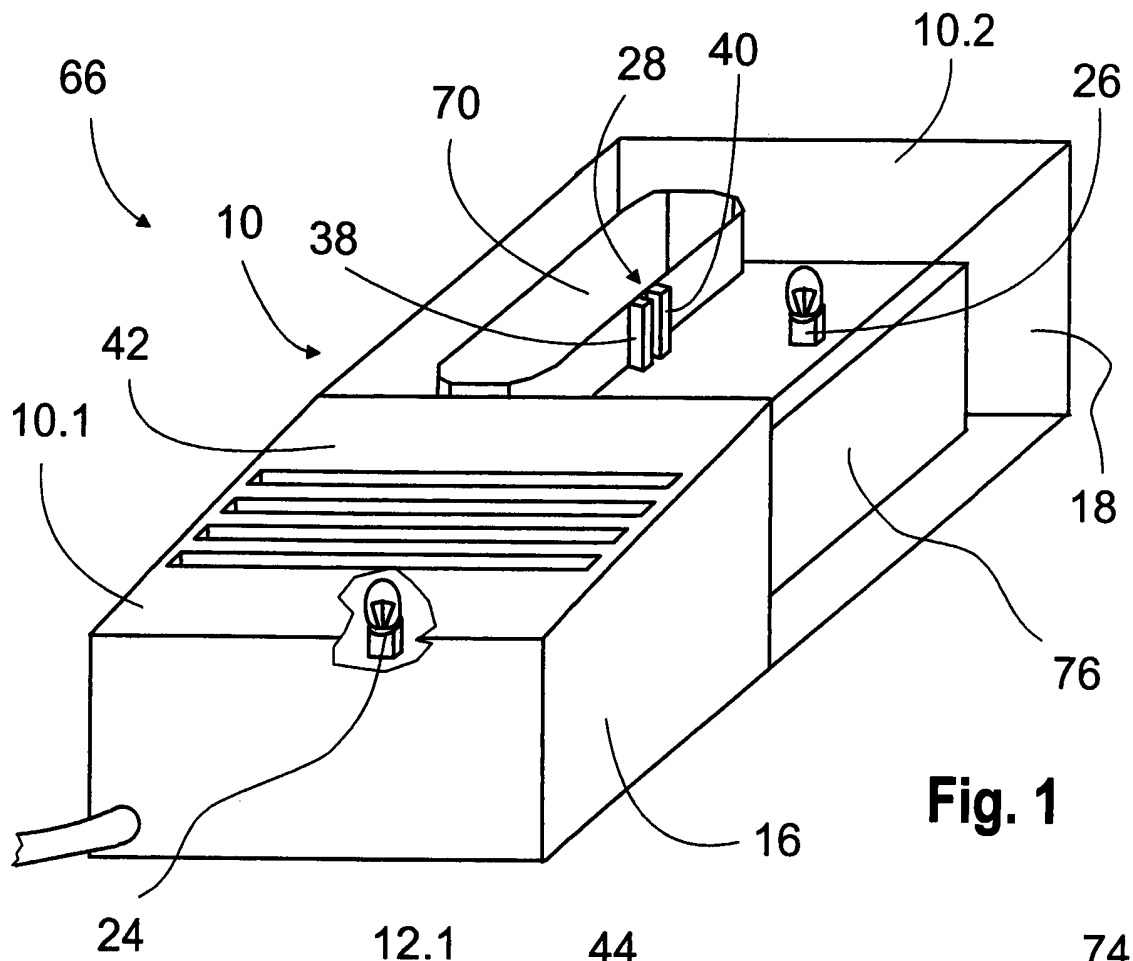


Fig. 1

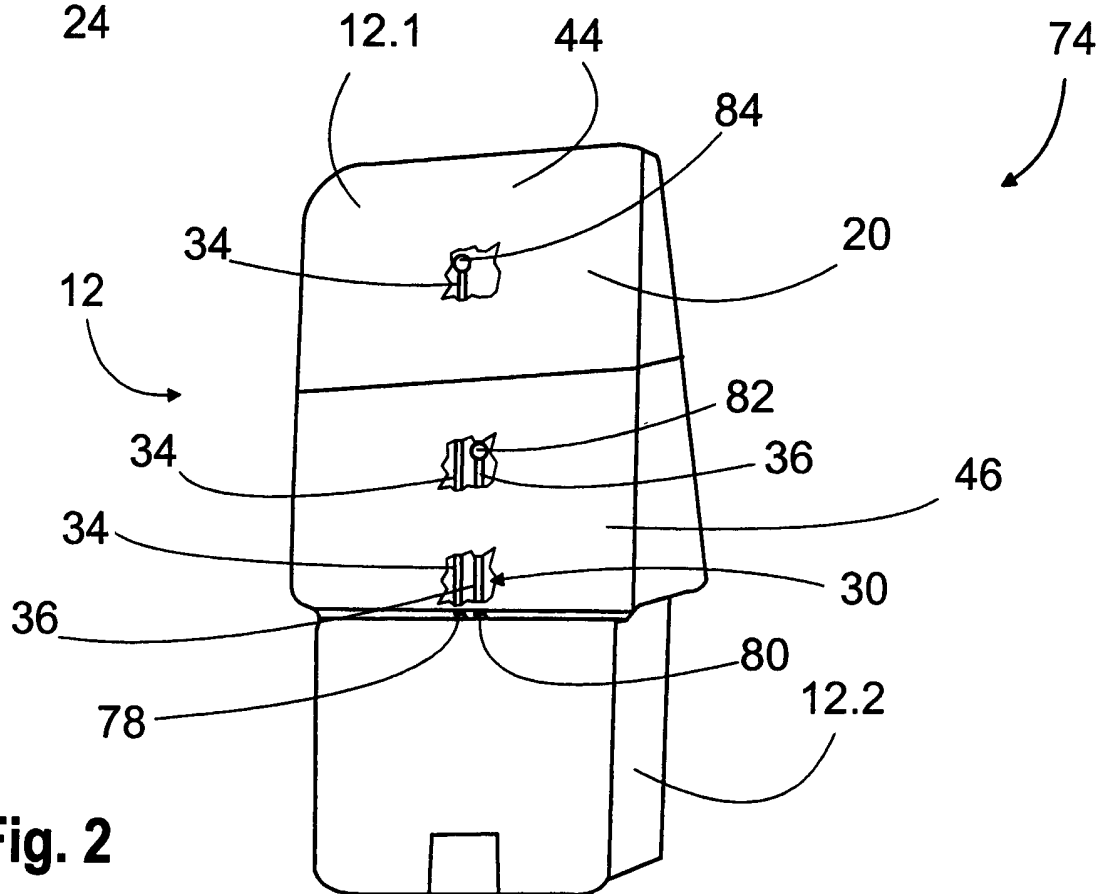


Fig. 2

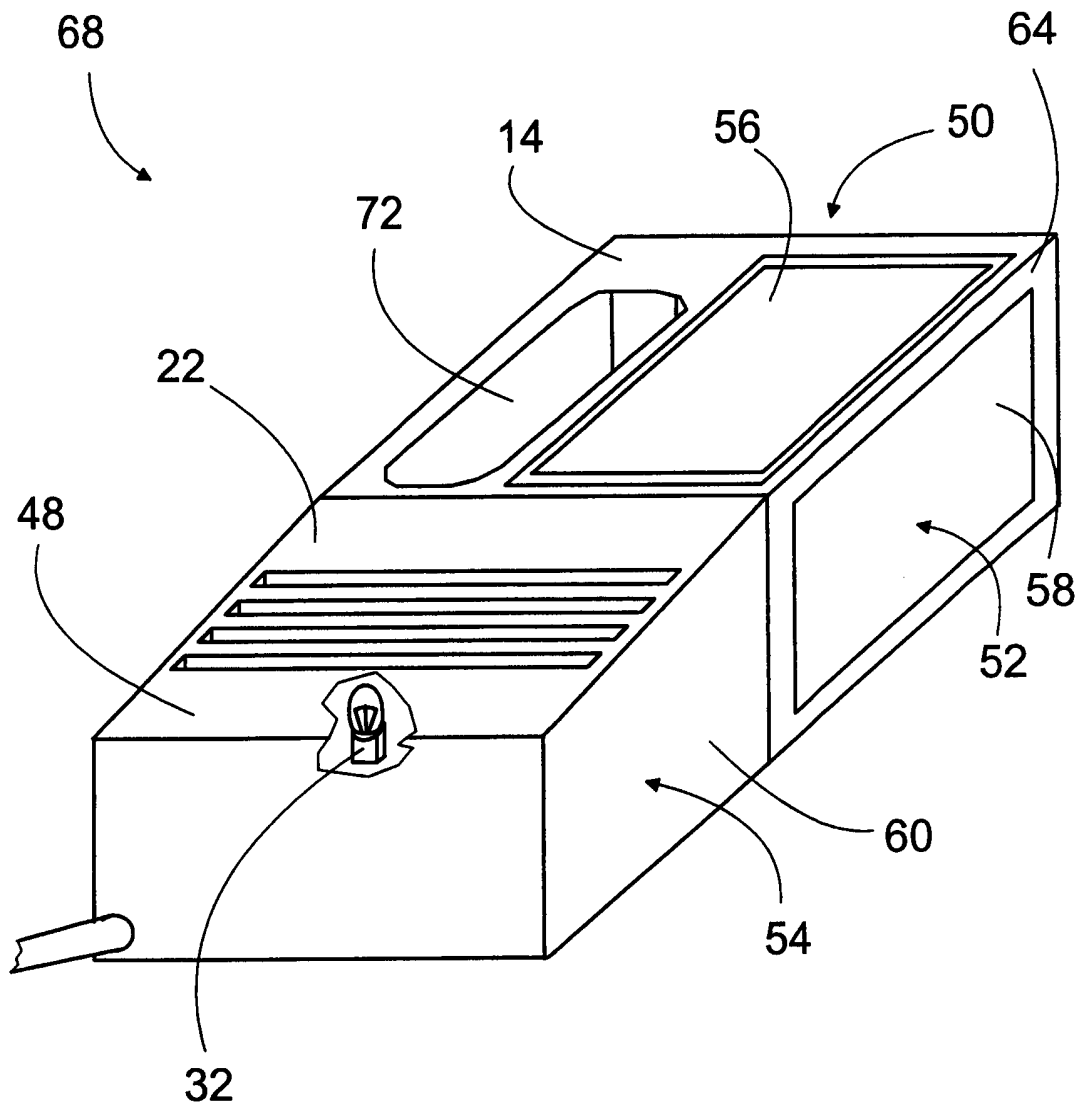


Fig. 3

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Charging Unit

Prior Art

- 5 The invention relates in particular to a charging unit having at least one housing element according to the precharacterising cause of Claim 1.

A charging unit designed as a charger, which comprises an opaque housing, is known, a lighting unit designed as a
10 light emitting diode being arranged on a cover side of the housing. The lighting unit is intended to transmit information about a charging process to an operator.

Advantages of the Invention

- The invention relates in particular to a charging unit
15 having at least one housing element.

It is proposed that the housing element should be formed at least partially by a light-transmissive material. A "housing element" is particularly intended to mean a "supporting element" of the housing. A housing element
20 should furthermore be understood particularly to mean components which have an area of more than 6 cm², particularly advantageously more than 9 cm² and preferably more than 15 cm² and/or which preferably from a plurality of sides of a housing. "Light" in this context is
25 particularly intended to mean visible light and "light-transmissive" in this context is particularly intended to mean a transmissivity which is more than 10% and

preferably more than 30% and particularly preferably more than 50%.

A corresponding configuration according to the invention can achieve particularly good visibility of the charging
5 unit over a large distance, particularly since large light-emitting surfaces and desired scattering effects can be achieved straightforwardly.

In a housing element which forms at least two, preferably at least three sides of a housing which comprises the
10 housing element, a light signal can advantageously be emitted with a large emission angle. A "large emission angle" is intended particularly to mean an emission angle which is advantageously more than 2π steradians.

Advantageous lighting of the housing element can be
15 achieved if at least one lighting unit of the charging unit is arranged inside a housing which comprises the housing element. Furthermore, emission over a plurality of side faces of the housing which comprises the housing element can readily be achieved, and advantageous
20 protection of the lighting unit can be provided. Various lighting means which appear expedient to the person skilled in the art may be used as the light source, for example incandescent bulbs, fluorescent tubes, energy-saving lights and/or one or more light emitting diodes.
25 Designing the lighting means as an incandescent lamp and/or fluorescent tube offers the advantage that the lighting means can easily be replaced by an operator, for example if the lighting means is defective, and cost-effective high-performance lighting means can be used, so

that a high light intensity and a concomitantly increased range of the light signal can be achieved.

The lighting unit is preferably intended to transmit charging process information. "Charging process
5 information" is particularly intended to mean information about a state of charge, a charging time etc. As an alternative and/or in addition, it is nevertheless also possible to transmit other information which appears expedient to the person skilled in the art, for example
10 temperature information, humidity information, information about defects etc.

By this optical transmission of the information, an operator can be made aware of an occurrence of the charging process and simultaneously be provided with the
15 corresponding information. In this way, charging problems can easily be detected and remedied promptly.

In a further configuration of the invention, the lighting unit is formed at least partially by a light guide. In this way, the lighting generated by a light source can be
20 guided in a controlled way to one and/or preferably several emission points where, for example, too little space is available to install a light source. With a corresponding configuration, light can furthermore be transmitted from one unit to another unit, so that one
25 light source can be used for a plurality of units, the light can be transported into an advantageously viewable region and/or lighting means can be economised, particularly in units which are intended for mobile use so that it is possible to avoid a weight increase of

corresponding mobile units due to additional lighting means.

It is furthermore proposed that the housing element should comprise at least one coloured section. The visibility of the charging unit can be increased by the conspicuous configuration of the coloured section. For example, the charging unit can therefore be found very quickly by an operator. The use of coloured light sources can furthermore be avoided. It is also possible to achieve advantageous flexibility in the information transmission if the housing element comprises a plurality of coloured sections, each of which is coloured with a different colour. A particular colour may, for example, be assigned to particular information.

The housing element is preferably at least partially transparent. Undesired filtering of a light signal as well as undesired losses can thereby be avoided, and cost-efficient emission of the light signal can be achieved. A transparent section also facilitates advantageous visual inspection of internal components of the charging unit.

A charging unit with a lighting unit is furthermore proposed, the lighting unit comprising at least one means formed at least partially by a light effect material. A "light effect material" is intended particularly to mean a photoluminescent, in particular fluorescent and/or phosphorescent, material which emits light during or after exposure to visible or ultraviolet light. "Light effect material" is furthermore intended to include an electroluminescent material which emits light by stimulation using electrical fields or electrical

discharge processes, as well as a particularly reflective material and/or a material which comprises thermochromic colours. In particular, increased visibility of the charging unit and cost-effectively large light-emitting surfaces can be produced by using a light effect material.

With the use of an electroluminescent material, for example a luminous film, it is possible to achieve a particularly flexibly driveable signalling device for the transmission of information with a space-saving solution, especially if its light emission is variably configured in respect of its intensity, colour and/or duration, for example by interval switching and/or pulsed operation etc. A "luminous film" in this context is particularly intended to mean a film by means of which electrical energy can be converted into light energy, in particular a film of multilayered structure with one layer formed by a back electrode, one by an insulator, one by a luminous material and one by a front electrode.

Particularly advantageous transmission of information, in particular temperature information, can be achieved by the use of thermochromic colours.

The means is advantageously formed at least partially by a photoluminescent material. Additional lighting means can thereby be avoided, and an especially compact lighting unit can be provided. It is furthermore possible to achieve advantageous light emission without an additional light source and concomitant costs.

In a further configuration of the invention, the means is formed at least partially by a housing element. It is

thereby possible to avoid a weight increase of the charging unit and/or economise on additional installation space for the lighting unit. Designing the means as a housing element advantageously further increases the visibility of the charging unit if a sizeable surface, particularly advantageously at least one side wall of the housing and particularly preferably the entire housing, is formed by a light effect material.

It is furthermore proposed that the means should be applied on a support element. Optionally, that is to say if an operator wishes, the means may be added to the charging unit. The means may be applied on the support element by force, shape and in particular material fitting, particularly using an adhesive.

It is particularly advantageous to design the means as a detachable means, so that an operator can equip the charging unit with a light effect material adapted to their preference and/or particular constraints and/or particularly easily replace a defective means.

It is advantageous to design the charging unit as a charger. In this configuration of the invention, for example, a plurality of accumulators can be charged in the charging unit, in which case a lighting unit which is connected to at least one accumulator, for example in combination with at least one light guide, may supply the accumulator with light. Additional installation space for a lighting unit of an accumulator and an associated weight increase of the accumulator can thereby be avoided. An energy supply device integrated in the charging unit designed as a charger may furthermore be used

advantageously, for example in order to supply energy via a contact device of the accumulator to a lighting unit arranged in the accumulator. As an alternative and/or in addition, it is nevertheless conceivable for the charging unit according to the invention to be formed by an accumulator.

Drawing

Further advantages will be found in the following description of the drawing. Exemplary embodiments of the invention are represented in the drawing. The drawing, the description and the claims contain numerous features in combination. The person skilled in the art will also expediently consider the features individually and combine them to form further sensible combinations.

- Fig. 1 shows a charging unit designed as a charger,
Fig. 2 shows a charging unit designed as an accumulator, and
Fig. 3 shows an alternative charging unit designed as a charger.

Description of the Exemplary Embodiments

Figure 1 and Figure 3 respectively show a charging unit 66 and 68 formed by a charger, with an accumulator compartment 70 and 72 into which a charging unit of Figure 2, formed by an accumulator 74, can be inserted.

Light-transmissive materials are used in the construction of the charger 66 and the accumulator 74. The charger 66 of Figure 1 has a housing 10, which comprises a front

housing part 10.1 and a rear housing part 10.2. A housing element 16, which forms three circumferential sides and the cover side of the front housing part 10.1, consists of a light-transmissive material, and a housing element 18, which forms three circumferential sides and the cover side of the rear housing part 10.2, consists of a transparent material. The accumulator 74 of Figure 2 has a housing 12 with an upper housing part 12.1 and a lower housing part 12.2, which is arranged in the accumulator compartment 70 when there is an accumulator 74 inserted in the charger 66. A housing element 20, which forms four circumferential sides of the upper housing part 12.1, consists of a light-transmissive material.

The use of coloured materials in the charger 66 and the accumulator 74 leads to particular conspicuity of the charger 66 and the accumulator 74. The housing element 16 of the charger 66 has a green-coloured section 42, which forms the cover side of the front housing part 10.1. The housing element 20 of the accumulator 74 has two sections 44 and 46, which are respectively coloured red and green.

During operation of the charger 66, the housing elements 16 and 18 are illuminated by a lighting unit 24 and 26, respectively, arranged inside the housing 10, each of which is designed as an incandescent bulb. A visible light signal emitted by the lighting unit 24 is scattered by means of the housing element 16 and emitted further outwards. This housing element 16, which is luminous during operation of the charger 66, is clearly visible in a conspicuous way for a distant operator. Owing to the transparent housing element 18, a light signal emitted by

the lighting unit 26 is emitted further outwards with less filtering by the housing element 18. Internal components 76 of the charger 66 are furthermore visible for an operator.

5 With the accumulator 74 inserted into the accumulator compartment 70, the housing element 20 is illuminated during operation of the charger 66 by a lighting unit 30, which comprises two light guides 34 and 36 and is arranged inside the housing 12. The accumulator 74 does not have
10 its own light source, but instead is supplied with light by a lighting unit 28 of the charger 66. This is done by connecting the light guides 34 and 36 to further light guides 38 and 40 of the lighting unit 28 via two light-guide contacts 78 and 80 of the accumulator 74. The light
15 is generated by two light emitting diodes (not shown in the figure) of the lighting unit 28, and is fed to the emission points 82 and 84 in the accumulator 74 by means of the light guides 34, 36, 38 and 40.

During the charging process of the accumulator 74,
20 information about this charging process can be optically communicated to an operator. An inserted accumulator 74 is signalled during operation of the charger 66 by a luminous green-coloured section 46. The operator is furthermore informed about the state of charge of the accumulator 74
25 by a luminous red-coloured section 44, specifically by the light intensity of the emitted signal being proportional to the state of charge of the accumulator 74. If there is a defect of the accumulator 74 or if the temperature of the accumulator 74 is too high, the operator can be made

aware of the problem by flashing of the red-coloured section 46.

Optical transmission of the information can furthermore take place at the charger 66. The end of the charging
5 process of the accumulator 74, or an interruption of this charging process due to a defect of the charger 66 and/or the accumulator 74, is signalled by flashing of the lighting unit 26. The operation of the charger 66 is signalled in a straightforward way by lighting the green-
10 coloured section 42. Other combinations of colours, light intensities, flashing frequencies etc. may also be envisaged for optical transmission of the information.

Other optical signalling techniques are used in the charger 68 of Figure 3, these being based on the use of
15 light effect materials. The charger 68 comprises three lighting units 50, 52 and 54, each of which has a means formed by a light effect material.

The lighting unit 50 comprises a means 56 designed as a luminous film. During a charging process of the
20 accumulator 74, the luminous film displays images which transmit the aforementioned information about the charging process to the operator with a high information density. The charging time and the temperature of the charger 68 are furthermore displayed.

25 The lighting unit 52 comprises a means 58 which is designed as a fluorescent adhesive. The means 58 is applied on a housing element of the housing 14, which is used as a support element 64, and is connected to it by material fitting or adhesive bonding. The means 58 is

formed by a fluorescent material and, without an additional energy source, contributes to increased visibility of the charger 68. The means 58 is detachable and can easily be replaced by an operator.

- 5 The lighting unit 54 comprises a means, designed as a housing element, which consists of a phosphorescent material. With the aid of the phosphorescent material 60, the charger 68 can emit light without a current supply and therefore be found quickly by an operator, particularly in
10 a dark room.

Combined use of light effect materials and light-transmissive materials is employed in the charger 68. The charger 68 has a housing element 22, which consists of a light-transmissive material. During operation of the
15 charger 68, the housing element 22 is illuminated by a lighting unit 32 arranged inside the housing 14, and the light signal emitted by the lighting unit 32 is scattered by the housing element 22 and emitted further outwards. The housing element 22 furthermore has a green-coloured
20 section 48.

List of references

10	housing	42, 44,	coloured section
10.1	front housing part	46, 48	
10.2	rear housing part	50, 52,	lighting unit
12	housing	54	
12.1	upper housing part	56, 58,	means
12.2	lower housing part	60	
14	housing	64	support element
16, 18,	housing element	66, 68	charging unit
20, 22		70, 72	accumulator
24, 26,	lighting unit		compartment
28, 30,		74	accumulator
32		76	internal components
34, 36,	light guide	78, 80	light-guide contact
38, 40		82, 84	emission point

Claims

1. Charging unit having at least one housing element (16,
5 18, 20, 22), characterised in that the housing element (16,
18, 20, 22) is formed at least partially by a light-
transmissive material.
2. Charging unit according to Claim 1, characterised by
10 at least one lighting unit (24, 26, 28, 30, 32) which is
arranged inside in a housing which comprises the housing
element.
3. Charging unit according to Claim 2, characterised in
15 that the lighting unit (24, 26, 28, 30, 32) is intended to
transmit charging process information.
4. Charging unit according to Claim 2 or 3,
characterised in that the lighting unit (28, 30) is formed
20 at least partially by a light guide (34, 36, 38, 40).
5. Charging unit according to one of the preceding
claims, characterised in that the housing element (16, 20,
22) comprises at least one coloured section (42, 44, 46,
25 48).
6. Charging unit according to one of the preceding
claims, characterised in that the housing element (18) is
at least partially transparent.

7. Charging unit having a lighting unit (50, 52, 54), in particular according to one of the preceding claims, characterised in that the lighting unit (50, 52, 54) comprises at least one means (56, 58, 60) formed at least partially by a light effect material.

8. Charging unit according to Claim 7, characterised in that the means (58, 60) is formed at least partially by a photoluminescent material.

10

9. Charging unit according to Claim 7 or 8, characterised in that the means (60) is formed at least partially by a housing element.

15 10. Charging unit according to Claim 7 or 8, characterised in that the means (58) is applied on a support element (64).

11. Charging unit according to one of the preceding
20 claims, characterised by design as a charger (66, 68).

12. A charging unit substantially as herein described with reference to the accompanying drawings.

5

Application No: GB0606811.8

Examiner: Mr Rowland Hunt

Claims searched: All

Date of search: 26 July 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-6, 11	JP 10084637 A (SANYO) see abstracts and figures
X	1-3, 5, 6, 11	WO 2004/017472 A1 (PARK) see particularly 1, fig. 1, 12, fig. 4 and page 3, line 7 to page 4, line 26
X	1-3, 5, 6, 11	EP 1251618 A2 (MAKITA) see particularly 61, fig. 8 and paragraph [0075].
X	1, 2, 5, 6, 11	GB 2292271 A (CHIN KUO HUNG) see whole document, particularly 13, fig. 1.
X	1, 5, 6, 11	DE 19727639 A1 (WELLA) see particularly fig. 4.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

H1R; H2H

Worldwide search of patent documents classified in the following areas of the IPC

H01M; H02J

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI