Title: AN ASSEMBLY COMPRISING AN ELECTRIC APPARATUS AND A CHARGING BASE, AND A CHARGING BASE

Abstract: An assembly (1) comprises a rechargeable battery-powered electric apparatus (2) and a charging base (3) for receiving and charging the apparatus (2). The apparatus (2) and charging base (3) are shaped such that they fit to each other in a finite number of different charging positions with respect to each other. One of the apparatus (2) and charging base (3) comprises a pair of first contact members (8), whereas the other comprises a plurality of second contact members (9) disposed such that these form a number of pairs of second contact members (9). The pair of first contact members (8) is engageable with a pair of second contact members (9) in any selected charging position. The number of pairs of second contact members (9) equals at least the number of said charging positions so as to guide electrical current from the charging base (3) to the apparatus (2) in any selected charging position.
An assembly comprising an electric apparatus and a charging base, and a charging base

FIELD OF THE INVENTION

The invention relates to an assembly comprising a rechargeable battery-powered electric apparatus and a charging base for receiving and charging the apparatus.

BACKGROUND OF THE INVENTION

Patent application GB 2 282 715 A discloses a battery-powered cordless device such as a shaver, which is provided with recharging contacts which are engageable with charging contacts of a cradle. The device can be placed on the cradle and oriented in any rotational position with respect to the cradle about an axis of rotation. Such a device requires a specific and dedicated shape for this function, such as a relatively large recess at the centre of the bottom part of the device. In some cases this is undesirable from the point of view of design of the apparatus.

SUMMARY OF THE INVENTION

It would be advantageous to provide an assembly which offers great flexibility of positioning the apparatus on the charging base but with limited requirements regarding the shape of the electric apparatus.

This desire is addressed with the assembly according to claim 1. Due to these features the shape of the apparatus does not require serious adaptations, especially of the contact members such as in the case of an assembly having an infinite number of charging positions. However, the assembly according to the invention still enables a user to connect the apparatus to the charging base in more than one charging position. Furthermore, in the assembly according to the invention, the design of an existing apparatus having a single pair of contact members, for example, can still be used but the assembly provides the possibility of selecting more than one charging position.

Claim 2 defines a practical embodiment of the assembly, but it does not mean that the entire apparatus or charging base needs to be rotationally symmetric. It is conceivable, for example, that only a receiving portion of the charging base is rotationally symmetric, whereas the remaining portion of the charging base has a different shape.
The embodiment as defined in claim 3 provides the opportunity to leave the axis of symmetry free of any contact members, which is advantageous if in a certain design of the apparatus it is not desired to have a contact member at this location, for example if a functional part, such as a shaving head in a shaver, is disposed at this location.

The advantage of the features according to claim 4 is that reliable contacts between the first and second contact members are provided.

Due to the features according to claim 5, each pair of second contact members is connectable to a single power source.

The advantage of the embodiment as defined in claim 6 is that it provides the opportunity to keep the functional head at least partly invisible during charging of the apparatus, for example by placing the apparatus upside down into a receiving recess of the charging base.

Practical embodiments of the assembly are defined in claims 7 and 8, and claim 9, making three and two charging positions possible, respectively.

Claim 10 defines an alternative assembly requiring a minimum number of second contact members, since each of the second contact members is used in two different charging positions. The electronic control unit controls the polarity of the second contact members of the charging base such that the battery of the electric apparatus can be charged in a reliable way when the pair of first contact members of the apparatus and any of the pairs of second contact members of the charging base are coupled to each other. A practical embodiment of the electronic control unit is defined in claim 11.

Another alternative embodiment of the assembly has the features according to claim 12. The advantage of this embodiment is that a limited number of second contact members are required without the necessity of additional electronics for switching the appropriate polarity on the second contact members. The common second contact member may be located on the axis of symmetry or may be part of an outer wall of the apparatus or the charging base which contacts one of the first contact members in each charging position.

The invention also relates to a charging base for receiving and charging a rechargeable battery-powered electric apparatus. An advantage of this charging base is that it is suitable for receiving existing apparatus which are provided with a pair of first contact members. Due to the features as defined in claim 13 such an existing apparatus can be connected to the charging base of the invention for recharging the battery in different positions of the apparatus with respect to the charging base.
The above-mentioned aspects and other aspects of the invention will be apparent from the following description with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of an embodiment of an assembly according to the invention.

Fig. 2 is an enlarged front view of the apparatus of the assembly of Fig. 1.

Fig. 3 is an enlarged top view of the charging base of the assembly of Fig. 1.

Fig. 4 is a similar view as Fig. 2, but shows an alternative embodiment of the apparatus.

Fig. 5 is a perspective cutaway view of the charging base of Fig. 3.

Fig. 6 is a perspective, partially cutaway view of an alternative embodiment of an assembly according to the invention.

Fig. 7 is a very schematic view of another alternative embodiment of a charging base of the assembly according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 shows an embodiment of the assembly 1 according to the invention. The assembly 1 comprises a rechargeable battery-powered electric apparatus 2 and a charging base 3 for receiving and charging the apparatus 2. In this embodiment the apparatus 2 is a shaving apparatus including a functional part in the form of three shaving heads 4, see Fig. 2. During charging of the apparatus 2 an end portion 5 of the apparatus 2 including the shaving heads 4 is received by a receiving portion, in this case a recess 6, of the charging base 3. In the embodiment of the assembly 1 the recess 6 of the charging base 3 is contoured similarly to the end portion 5 of the apparatus 2, see Figs. 2 and 3. These Figures also show that the apparatus 2 and the charging base 3 are rotationally symmetric about an axis of symmetry which is the centre line of the apparatus 2 and the charging base 3, in this case.

Due to the equiangular orientation of the three shaving heads 4 about the axis of symmetry, the recess 6 comprises equiangular circular segmental outer edges 7, see Fig. 3. The shaving heads 4 as well as the circular segments of the recess 6 are oriented rotationally symmetrically at 120 degrees about the axis of symmetry. As a consequence, the apparatus 2 and the charging base 3 fit to each other in a finite number of different charging positions, in this case three charging positions.
The apparatus 2 comprises a single pair of first contact members 8 and the charging base 3 comprises three pairs of second contact members 9. The pair of first contact members 8 of the apparatus is engageable with a pair of second contact members 9 of the charging base 3 in any selected charging position. This means that the number of pairs of second contact members 9 is equal to the number of charging positions. In the embodiment of Fig. 1 this means that the apparatus 2 can be charged in three different charging positions, which facilitates handling by the user when the apparatus 2 needs to be charged.

Fig. 4 shows an alternative embodiment of an apparatus 2, which can also be used together with the charging base 2 of Fig. 3. In this embodiment the first contact members 8 of the pair of first contact members 8 are located at an angle of 120 degrees with respect to each other about the axis of symmetry. This means that the pair of first contact members 8 are engageable to a corresponding pair of second contact members 9 on the charging base 3 since second contact members 9 of opposite polarity are also located at an angle of 120 degrees with respect to each other about the axis of symmetry.

As illustrated in Fig. 5, the first contact members 8 belonging to the apparatus 2 are formed by pins and the second contact members 9 are formed by resilient charging strips. The second contact members 9 are interconnected such that the contact members 9 of similar polarity are connected to each other in parallel.

Figs. 1 and 5 show a connector 10 for connecting the second contact members 9 of the charging base 3 to a single power supply for supplying electrical current to the charging base 3.

Fig. 6 shows an alternative embodiment of a shaving apparatus 2. In this embodiment the apparatus, which is also called a foil shaver, has a functional part in the form of one shaving head 4. The frontal area of the shaving head 4 has a rectangular shape. Fig. 6 illustrates that the embodiment of the assembly 1 provides two different charging positions which have a rotational symmetry of 180 degrees about the axis of symmetry, which is a longitudinal axis through the centre of the apparatus 2 and the charging base 3, in this case. The pair of first contact members 8 are positioned on one side of the apparatus, and two pairs of second contact members 9 are positioned at opposite sides within the recess 6. The recess 6 has a rectangular cross section, in this case.

The contact members 8, 9 in the various embodiments as shown in the Figures and discussed hereinbefore are spaced from the axis of symmetry of the assembly. It is, however, also conceivable that the charging base 3 has a finite number of second contact members 9 of one polarity, which number is equal to the number of the charging positions,
but only a single second contact member 9 of different polarity, which is used as a common
d second contact member 9 in all charging positions. In this case the apparatus 2 still has two
first contact members 8 engageable to a pair of second contact members 9 in any charging
position. The common second contact member 9 could be located at the axis of symmetry or
could be formed by the housing of the charging base 3 which is in contact with the housing of
the apparatus 2 in any charging position.

Fig. 7 shows another alternative embodiment of a charging base 3 of the
assembly 1 according to the invention. In this case the charging base 3 comprises a number
of second contact members 9 which is equal to the number of the charging positions, in this
case three charging positions since the assembly is rotationally symmetric about the axis of
symmetry at angles of 120°. This means that each of the second contact members 9 is
engageable with one first contact member 8 of the pair of first contact members 8 of the
apparatus 2 in one charging position and with the other one in a different charging position.
This is illustrated in Fig. 7 for three different charging positions. It can also be imagined that
each of the second contact members 9 requires a positive polarity in one charging position
and a negative polarity in the other charging position, since for charging a battery of the
apparatus the first contact members 8 thereof require a similar polarity difference,
independent of the charging position. Therefore, the second contact members 9 are connected
to an electronic control unit 11, which is adapted for controlling the polarity of each second
contact member 9 in dependence upon the charging position.

The electronic control unit 11 is provided with an impedance measurement
circuit for scanning a load between each pair of second contact members 9 (not shown). The
circuit provides a charging position signal, which is receivable by a control circuit for
controlling the polarity of each second contact member 9 on the basis of that signal. This
means that when the user connects the apparatus 2 to the charging base 3 in an arbitrary
charging position, the electronic control unit 11 observes a certain charging position and
switches the appropriate polarity on the pair of second contact members 9 which are in
contact with the first contact members 8 of the apparatus 2.

From the foregoing it will be clear that the invention provides an assembly
comprising a rechargeable battery-powered electric apparatus and a charging base for
receiving and charging the apparatus, which assembly allows different charging positions of
the apparatus with respect to the charging base, whereas the requirements to be met by the
apparatus regarding its shape are limited. Furthermore, an existing apparatus design requires
only limited or no modifications when used with the charging base according to the invention.

The invention is not restricted to the above-described embodiments as shown in the drawings, which can be varied in several ways without departing from the scope of the claims. Features of the various embodiments may be combined. The electric apparatus is not limited to a shaving apparatus, but alternative apparatus including a rechargeable battery are conceivable, such as telephones, electric tooth brushes, etc.

In general it is noted that, in this application, the expression “comprising” does not exclude other elements or steps, and “a” or “an” does not exclude a plurality. Reference signs in the claims shall not be construed as limiting the scope thereof.
CLAIMS:

1. An assembly (1) comprising a rechargeable battery-powered electric apparatus (2) and a charging base (3) for receiving and charging the apparatus (2),
   the apparatus (2) and charging base (3) being shaped such that they fit to each other in a finite number of different charging positions with respect to each other,
   wherein one of the apparatus (2) and charging base (3) comprises a pair of first contact members (8), whereas the other comprises a plurality of second contact members (9) located such that these form a number of pairs of second contact members (9), the pair of first contact members (8) being engageable with one pair of second contact members (9) in any selected charging position,
   wherein said number of pairs of second contact members (9) equals at least the number of said charging positions so as to guide electrical current from the charging base (3) to the apparatus (2) in any selected charging position.

2. An assembly (1) according to claim 1, wherein the assembly (1) has an axis of symmetry about which said charging positions are rotationally symmetric.

3. An assembly (1) according to claim 2, wherein the first and second contact members (8, 9) are spaced from the axis of symmetry.

4. An assembly (1) according to claim 1, wherein the engageable first and second contact members (8, 9) are formed by pins and charging strips, respectively.

5. An assembly (1) according to claim 1, wherein the second contact members (9) of similar polarity are coupled to each other in parallel.

6. An assembly (1) according to claim 1, wherein the apparatus (2) is provided with a driven functional part, such as a shaving head (4), wherein at least a first or second contact member (8, 9) is disposed near said functional part, and wherein the functional head faces the charging base (3) in any charging position.
7. An assembly (1) according to claim 2, wherein the apparatus (2) is a shaving apparatus (2) including a functional part comprising three shaving heads (4) disposed rotationally symmetrically at equal mutual angles about the axis of symmetry, wherein the functional part is receivable by and fits to a recess (6) of the charging base (3) in three different charging positions, wherein the pair of first contact members (8) is located close to the functional part and wherein the charging base (3) comprises six second contact members (9) so as to form three pairs of second contact members (9).

8. An assembly (1) according to claim 7, wherein the functional part and the recess (6) have triangular shapes such that they fit to each other in said three different charging positions.

9. An assembly (1) according to claim 2, wherein the apparatus (2) is a shaving apparatus (2) including an elongated functional part comprising one shaving head (4), wherein the functional part is receivable by and fits to an elongated recess (6) of the charging base (3) and the charging positions are rotationally symmetric at an angle of 180 degrees about the axis of symmetry, hence forming two different charging positions, and wherein the pair of first contact members (8) is located close to the functional part, and wherein the charging base (3) comprises four second contact members (9) so as to form two pairs of second contact members (9).

10. An assembly (1) according to claim 3, wherein the apparatus (2) comprises the pair of first contact members (8) and the charging base (3) comprises the second contact members (9), and wherein the number of second contact members (9) equals the number of said charging positions, hence each of the second contact members (9) is engageable with one first contact member (8) of the pair of first contact members (8) in one charging position and with the other one in a respective one of the charging positions, and wherein the second contact members (9) are connected to an electronic control unit (11) adapted for controlling the polarity of each second contact member (9) in dependence on the charging position, such that a polarity difference between the first contact members (8) is substantially similar in each charging position.
11. An assembly (1) according to claim 10, wherein the electronic control unit is provided with an impedance measurement circuit for scanning a load between each pair of second contact members (9) and providing a charging position signal, and a control circuit for controlling the polarity of each second contact member (9) on the basis of the charging position signal.

12. An assembly (1) according to claim 1, wherein the second contact members (9) include a common second contact member (9) which forms one of the pair of second contact members (9) in each charging position.

13. A charging base (3) for receiving and charging a rechargeable battery-powered electric apparatus (2) having a charging portion, wherein the charging base (3) comprises a receiving portion (6) for receiving the charging portion of the apparatus (2), which receiving portion is rotationally symmetric about an axis of symmetry in a finite number of rotational positions of the charging base (3) with respect to said axis, wherein the charging base (3) comprises a plurality of second contact members (9) disposed such that these form a number of pairs of second contact members (9) equal to the number of said rotational positions, wherein the pairs are located equiangularly with respect to the axis of symmetry.
### INTERNATIONAL SEARCH REPORT

**International application No**

**PCT/IB2008/052463**

#### A. CLASSIFICATION OF SUBJECT MATTER

**INV. H01R31/06**

According to International Patent Classification (IPC) or to both national classification and IPC

#### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**H01R**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**EPO-Internal**

#### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category*</th>
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**Date of the actual completion of the international search**

12 November 2008

**Date of mailing of the international search report**

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