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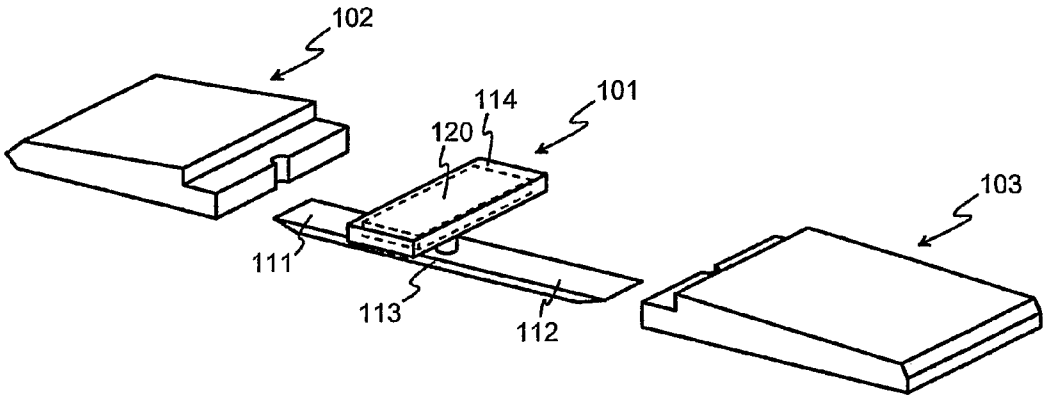
(54) **Title:** MODULAR COMMUNICATION APPARATUS



(57) **Abstract:** A communication device comprises a first structural module (101, 401) with a power source (120), as well as second (102, 302, 402), and third (103, 403) structural modules. The first structural module (101, 401) is between the second (102, 302, 402) and third (103, 403) structural modules. The assembled communication device (501) so formed has an elongated form, in which the second (102, 302, 402) structural module is in a first end, the third structural module (103, 403) is in a second end and the first structural module (101, 401) is at least partly between the second (102, 302, 402) and third (103, 403) structural modules.

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Modular communication apparatus

PRIOR ART

The invention is generally related to the structures of portable communication devices. Especially the invention is related to how technical solutions can be made to better serve the objectives of sustainable development and ecological consumption.

BACKGROUND OF THE INVENTION

Portable communication devices constitute a significant part of the material goods that are consumed around the world. Communication is a human basic need, so it is not too much to assume that sooner or later every person in the world will have some kind of an electronic communications device at his or her disposal. The technology advances fast, fashion trends change, and there is a large number of companies worldwide trying to maintain and increase their businesses related to manufacturing, selling and use of communication devices. From the ecological viewpoint it would be recommendable to bring forward certain considerations. The amount of waste that comes from used communication devices and their parts should be kept reasonable. If possible, the communication device should be so designed that even if some single part wears out, gets broken or becomes obsolete still does not force to change the whole device to a new one. Especially parts that include constituents or components that are rare, difficult to handle or environmentally hazardous should be easy to recycle appropriately or to otherwise forward to proper waste management.

BRIEF DESCRIPTION OF THE INVENTION

An objective of the present invention is to present a structural solution for a communication device, which serves ecological aims.

The objectives of the invention are achieved by assembling a communication device from modules, which are replaceable and the parts of which may serve many different purposes.

Characteristic to the communication device according to the invention is that which has been presented in the characterising part of the independent claim.

Fig. 1 illustrates a communication apparatus according to an embodiment of the invention,

fig. 2 illustrates a communication apparatus according to another embodiment of the invention,

fig. 3 illustrates a communication apparatus according to yet another embodiment of the invention,

fig. 4 illustrates a communication apparatus according to yet another embodiment of the invention, and

fig. 5 illustrates an assembled communication device according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION AND ITS EMBODIMENTS

Fig. 1 is an exploded view of a communication device, which comprises three structural modules. The middle module 101 comprises a power source 120 (shown here only schematically), which is most advantageously a fuel cell that utilises hydrogen. An estimated useful lifetime of a fuel cell is even up to 5-10 years, while taken the battery technology as known today, batteries of mobile communication devices last typically at most about 2 years. A fuel cell has also other advantageous properties, like easy recyclability (the cell comprises a lot of nickel) and the possibility of producing the required raw material of energy (hydrogen) locally by using renewable energy sources.

The communication device is assembled by attaching the second module 102 on one side of the first module 101 and a third module 103 on the other side of the first module 101. An assembled communication device has an elongated form, of which the second structural module 102 forms the first and the third structural module 103 forms the second end. The first structural module 101 is located between the second and third modules.

The first structural module 101 has not only an attaching function but a function of mechanically supporting the structure. For this purpose the form of the first module consists of two parts. The elongated part 113, the ends of which can be desig-

nated as the first protrusion 111 and the second protrusion 112, is parallel to the longitudinal axis of the elongated form of the assembled communication device. The first protrusion 111 supports mechanically the second structural module 102, and the second protrusion 112 supports mechanically the third structural module 103. In this embodiment the protrusios are against the outer surfaces of the second and third structural modules in an assembled communication device. Alternatively, at least one of them could be at least partly inside the corresponding structural module in an assembled communication device, if the respective structural module has a receptive cavity for this purpose. Fig. 4 is an exploded view of a communication device, in which the first elongated protrusion 411 of the first structural module 401 is adapted to fit in the slot 413 in the second structural module 402. Similarly the second elongated protrusion 412 of the first structural module 401 is adapted to fit in a slot 414 drawn in dashed line in the third structural module 403.

Placing the power source to the first structural module 101 is advantageous, because the first structural module 101 constitutes a central part of the structure of the assembled communication device. The user may, at his or her will, replace the structural modules at the ends with other modules, but it is very probable that all, even mutually alternative modules have functionalities that require electric current, which they get from the power source included in the first structural module 101.

Fig. 2 illustrates, how it is possible to add other structural modules to the structure for example by attaching them between the first module 101 and one of the second 102 and third 103 modules. Fig. 3 illustrates, how it is possible to add other structural modules to the structure for example by attaching them at least partly inside one of the second 102 and third 103 modules.

The functional parts of the communication device, like a transmitter and a receiver, signal processing circuits, keypad and touch area or other input means, display or other indicator means, microphone, loudspeaker and the like can be placed in the structural modules in various ways. According to one advantageous embodiment each module represents a certain functionality or a combination of certain functionalities, so that the user may use the modules at his or her disposal to assemble a communication device that best responds to the actual needs each time. Examples of such functional modules are a telephone module of a cellular radio system, a data transfer module, FM radio receiver module, media storage and retrieval module (MP3 player), positioning module, memory module and so on. This list is

not limiting from the viewpoint of the invention. Due to the easy exchangeability of the modules, it is easy to replace for example a broken, lost or obsolete module with a new one without having to replace the whole communication device.

Fig. 5 shows one example of how in an assembled communication device 501 there are input means (here: a touch area 503, which technically is a touch-sensitive display part) in one of the structural modules, and a display 502 in another one of the structural modules. The touch area 503 is on the same side of the communication device as the display 502. In the assembled communication device 501 the touch-sensitive display part is adjacent to the display 502 and separated therefrom by only a surface of a transversal part of the first structural module. Together the touch-sensitive display part, the display 502 and said surface of the transversal part cover an essentially whole side surface of the assembled communication device 501.

At least part of the surface of at least one module may comprise a so-called e-ink area, which is an area functioning as an electrically controlled note- and display area. As an example, an electrically controlled note- and display area 504 appears on a surface of the first structural module in fig. 5, but one could alternatively or additionally be in at least one of the other modules. For the materials of the modules, it is advantageous to use recycled, recyclable and/or biodegradable materials.

Claims

1. A communication device, comprising:
- a first structural module (101, 401), which comprises a power source (120),
- a second structural module (102, 302, 402), and
- a third structural module (103, 403);
characterized in that
- the first structural module (101, 401) is adapted to attach between the second (102, 302, 402) and third (103, 403) structural modules, so that when the second (102, 302, 402) and third (103, 403) structural module are attached to the first structural module (101, 401) the assembled communication device (501) so formed has an elongated form, in which the second (102, 302, 402) structural module is in a first end, the third structural module (103, 403) is in a second end and the first structural module (101, 401) is at least partly between the second (102, 302, 402) and third (103, 403) structural modules.

2. A communication device according to claim 1, **characterized** in that the first structural module (101, 401) comprises a first elongated protrusion (111, 411), which in the assembled communication device (501) is essentially parallel to a longitudinal axis of the elongated form and which is adapted to form a mechanical support for the second structural module (102, 302, 402).

3. A communication device according to claim 2, **characterized** in that in the assembled communication device (501) the first elongated protrusion (111) is against the outer surface of the second structural module (102, 302).

4. A communication device according to claim 2, **characterized** in that in the assembled communication device (501) the first elongated protrusion (411) is inside the second structural module (402).

5. A communication device according to any previous claim, **characterized** in that the first structural module (101, 401) comprises a second elongated protrusion (112, 412), which in the assembled communication device (501) is essentially parallel to a longitudinal axis of the elongated form and which is adapted to form a mechanical support for the third structural module (103, 403).

6. A communication device according to claim 5, **characterized** in that the second elongated protrusion (112, 412) is adapted to point into an opposite direction than the first elongated protrusion (111, 411).

7. A communication device according to claim 5 or 6, **characterized** in that in the assembled communication device (501) the second elongated protrusion (112) is against the outer surface of the third structural module (103).

8. A communication device according to claim 5 or 6, **characterized** in that in the assembled communication device (501) the second elongated protrusion (412) is inside the third structural module (403).

9. A communication device according to any of claims 6, 7 or 8, **characterized** in that the first (111, 411) and second (112, 412) elongated protrusions are the opposite ends of the same elongated part (113).

10. A communication device according to claim 9, **characterized** in that the first structural module (101, 401) comprises said elongated part (113) a part (114) transversal thereto, which is located transversally essentially at the middle of the elongated part (113).

11. A communication device according to claim 10, **characterized** in that the thickness of the first structural module (101, 401) from a top surface of the transversal part (114) to a bottom surface of the elongated part (113) is in the assembled communication device (501) essentially the same as the thickness of the assembled communication device (501).

12. A communication device according to any previous claim, **characterized** in that it comprises a fourth structural module (201), which is adapted to attach between the first structural module (101) and either the second (102, 302) or third (103) structural module, so that when the structural modules are attached to each other, the assembled communication device so formed has an elongated form, in which the second structural module (102, 302) is in a first end, the third structural module (103) is in a second end, and the first (101) and fourth (201) structural modules are at least partly between the second (102, 302) and third (103) structural modules.

13. A communication device according to any previous claim, **characterized** in that it comprises a fifth (301) structural module, which is adapted to attach inside the second (302) or third structural module.

14. A communication device according to any previous claim, **characterized** in that the power source comprises a fuel cell.

15. A communication device according to claim 1, **characterised** in that at least one of the structural modules comprises a touch area (503).

16. A communication device according to claim 1 or 15, **characterised** in that at least one of the structural modules comprises a display (502).

17. A communication device according to any of claims 1, 15, or 16, **characterised** in that the surface of at least one of the structural modules comprises an electrically controlled note and display area (504).

18. A communication device according to claim 1, **characterised** in that one of the structural modules comprises a touch area (503), and another one of the structural modules comprises a display (502).

19. A communication device according to claim 18, **characterised** in that in the assembled communication device (501) said touch area (503) is on the same side of the communication device as said display (502).

20. A communication device according to claim 19, **characterised** in that:
- said touch area (503) is a touch-sensitive display part located in the third structural module,
- said display (502) is located in the second structural module,
- in the assembled communication device (501) said touch-sensitive display part is adjacent to said display (502) and separated therefrom by only a surface of a transversal part of the first structural module, so that together said touch-sensitive display part, said display (502) and said surface of said transversal part cover an essentially whole side surface of the assembled communication device (501).

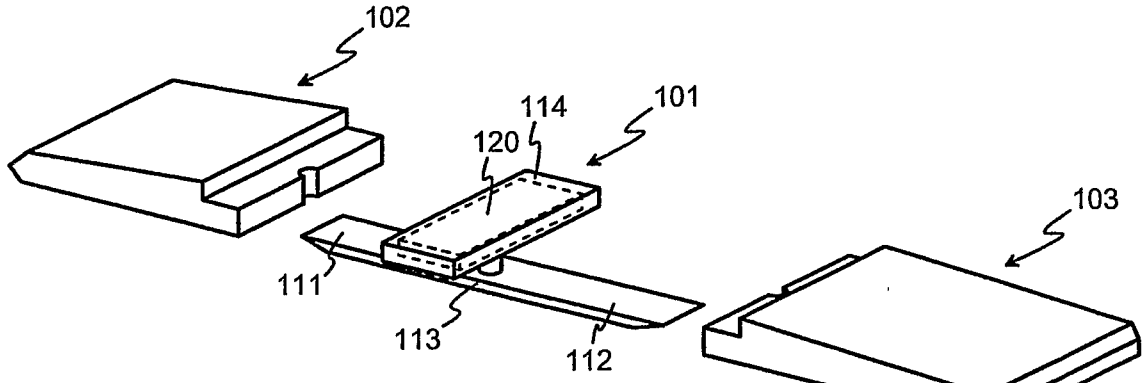

Fig. 1

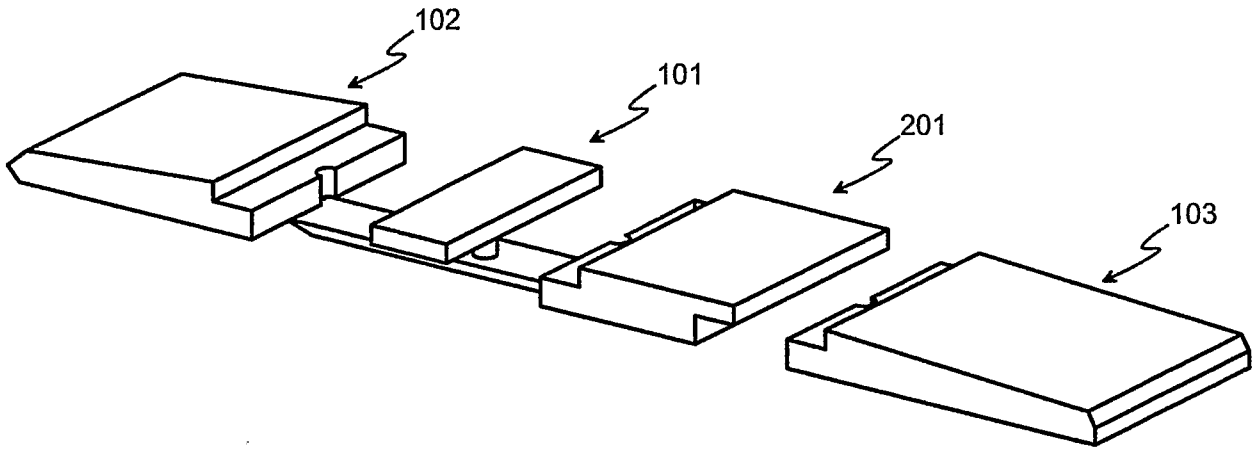

Fig. 2

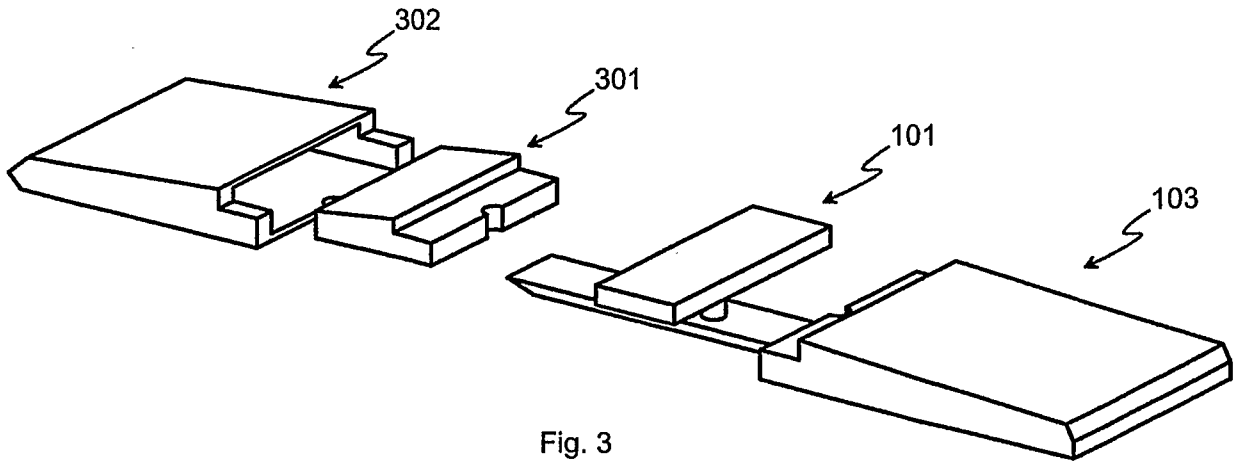

Fig. 3

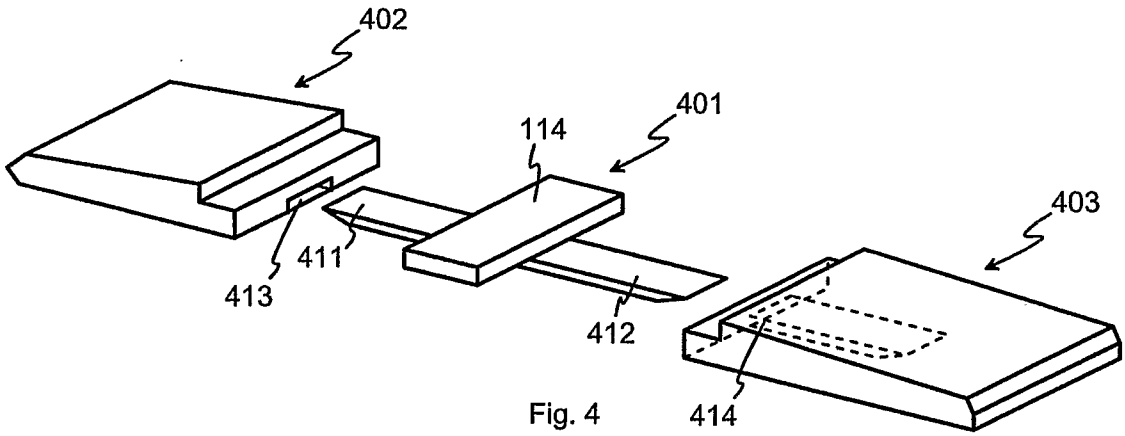

Fig. 4

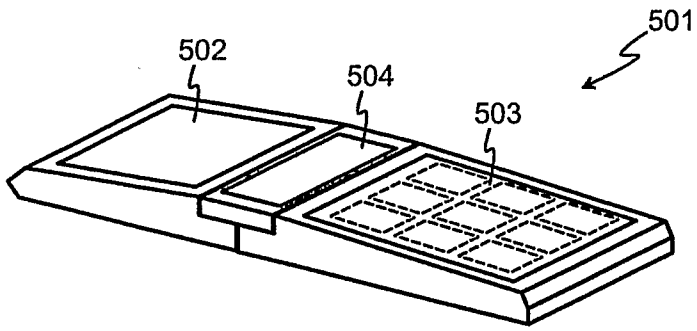

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2006/000363

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8: H04M

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

DK, FI, NO, SE

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

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

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CLASSIFICATION OF SUBJECT MATTER

Int.Cl.
H04M 1/02 (2006.01)