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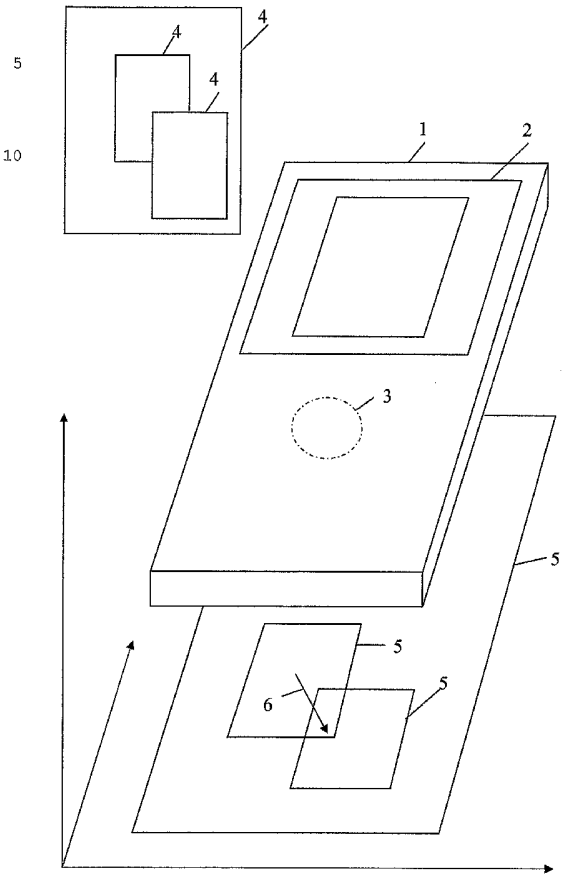
(54) **Title:** METHOD TO CONTROL A DISPLAY



(57) **Abstract:** This invention relates to a method for controlling a display unit, which is integrated into a data processing unit, e.g. a cellular phone or a PDA-unit (Personal Data Administrator). This type of units typically have a display that is too small to allow presentation of for instance letter sized documents. The invention makes it possible to display such a document by altering the picture of the document on the units display.

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METHOD TO CONTROL A DISPLAY

Area of technology

This invention relates to a method for controlling a display unit, which is integrated into a data processing unit.

Background of the invention.

The progress in data processing and data communication enables the user to handle large volumes of data. For example, the mobile terminals of today, e.g. cellular phones and PDA-units (Personal Data Administrator), support direct handling of information such as e-mail, web pages on internet and other documents. The development of the cellular phone systems, such as 3G, will lead to even greater possibilities to fast download of large data volumes.

Users of mobile units will have an increasing need for simple navigation through the information that is downloaded to the mobile unit in some way, while the display on a mobile unit is considerably smaller than a ordinary computer screen and does not allow normal display of, for example, a normal web page. Since size reduced documents are difficult to read, if at all possible, there is a need to pan the document in some way. In other words, to look at a part of the document at the time.

On a small handheld terminal there is not room enough for devices such as a computer mouse. Without time consuming and repetitive use of scroll bars it is not possible to read for example an ordinary web page from the Internet, for example. Scrolling refers to moving the image of one part of a picture or document, shown in the

display unit, to the left/right or up/down. The lack of computer mouse makes it more difficult to use a cursor on the display unit.

In GB 2357684, the use of gyro is suggested to detect spatial and/or angular movement and to transform this movement into a change of the image displayed. Such a solution is technically complicated to design and produce, which leads to high production cost and high price.

Other suggested methods to detect movement of the handheld terminal are to equip it with devices such as ultra sound sensor and pitch sensor. Here as well the design gets considerably more technically complicated compared to known mobile terminals.

Summarizing the invention

The purpose of the invention is to achieve an improved method compared to known technology, for controlling a display unit which is connected to a data processing unit and which enables simplified use and a simpler design of the data processing unit.

This and other purposes, to be described in the following, are achieved by a method for controlling a display unit connected to a data processing unit and furthermore has the distinctive features stated in the characterizing part of the following claim 1 with preferred embodiments in related subclaims. The above mentioned purpose is also obtained by supplying a data processing unit according to claim 12 with preferred embodiments and related subclaims.

The by the invention accomplished method is extremely advantageous since data processing units equipped with or which can be connected to a camera, do not need additional components. It is not necessary to include special, technically complicated and costly instruments for spatial detection into the data

processing unit. Furthermore by this, there is no need for arrangements having movable mechanic parts with less reliability and increased risc of malfunctioning as result.

A particular advantage is that the invention is generally applicable to many different types of data processing units having a display unit, for example cellular phones, PDAs and personal computers.

Brief description of drawings

Figure 1 shows a data processing unit with digital camera over a surface xy (e.g. a desktop) in accordance with a first embodiment and a paper copy of a document that is also electronically stored in the data processing unit.

Figure 2 shows a data processing unit and the users finger grip according to a second embodiment. The figure illustrates calibration of the cursor symbol position on the display related to a point on the users thumb grip.

Figure 3 shows the thumb grip according to a second embodiment and a user interface whose object and menu buttons can be moved/affected by moving the thumb grip and the cursor.

Figure 4 shows a data processing unit with camera facing towards a paper copy, with buttons for entering characters.

Description of preferred embodiments of the invention

Panning and zooming

In a first embodiment of the invention the objective is to make it possible to view selected parts of a document 40 (in digital form) that may contain for example picture and/or text (ref. fig. 1) on a display unit 20 that is to small to be able to read the entire document 40.

In this embodiment, movements of the image from the camera 30 is associated with a panning and/or zooming of the computer graphic image object (hereinafter referred to as image object) shown on the display unit 20. The image object may be a document or part of a document consisting of text and/or picture. It may also be a sole object in a document or in a user interface in an application running on the data processing unit. The camera 30 is in the example mounted on the underside of the data processing unit 10 aimed perpendicular down towards the surface xy.

Figure 1 shows this first embodiment of the invention. A data processing unit 10 with display unit 20 and a built in digital camera 30 is positioned over a surface, for example a desktop, with the camera aimed perpendicular down towards the surface. On the surface there is a imaginary system of coordinates xyz.

The data processing unit 10 is loaded with a document. A paper copy 40 of this document is shown in figure 1. The display unit 20 shows a first image object which in this example corresponds to a part 41 in the centre of the document 40. The camera registers a image of a part 51 of the surface xy but this is not shown in the display unit 20.

The image of area xy will be analyzed by means of software in the data processing unit 10, with respect to how the content of the picture moves and how the size of the part of the area xy that are part of the picture information from the camera changes.
A movement of the data processing unit 10 parallel with the xy-plane, i.e. in the direction depictured by the arrow 60, results in that graphical information collected by the camera 30 to be panned (or scrolled) in the same direction.

A movement of the dataprocessing unit in z-direction towards the area xy result in that the graphical information that are collected by the camera 30 will become a smaller part of the area xy.

The result of this spatial movement is three data values which define movement in the coordinatesystem xyz of the data processing unit 10.

- Movement along the x-axis
- Movement along the y-axis
- Movement along the z-axis

These data values will be filtered to achive more stable values as the input for the control of the display unit 20.
The filterfunctions will primarily be lowpass-filtering and/or hysteresis-filtering.

The filtered numerical values will be input to the part of the software in the dataprocessing unit 10 which control the display unit 20, that is the scroll function and the zoom function.
The movement described above, of data processing unit 10, will cause the initially displayed image object representing part 41, to be panned out upwards to the

left in the display unit 20. When the graphical information from the camera contains part 52 of the area xy, a graphical object corresponding to part 42 of the document will then be shown on the display unit 20 instead.

This will create the impression that the document 40 that is viewed, is placed on the table, (area xy), and that the document 40 are viewed through a "peephole" wich is the display unit 20 in dataprocessing unit 10. All parts of the document 40 (in digital form) can be viewed on the display unit 20, by moving the data processing unit 10 parallel with the area xy, so that the camera 30 detects graphical objects within the area 55 in the xy-plane.

If the data processing unit 10 are moved along the z-axis down towards the area xy, the graphical information from the camera 30 will comprice a smaller part of the area xy. This will control the display unit 20 so that an image object that represents a smaller and enlarged part of document 40 will be shown on the display unit 20. This represents a zoom of the image object 40.

Pointing device function by means of the thumb-index finger grip

Furthermore the invention permits a pointing device function to be created, by detetecting the movement of the users fingers or an other object that is detected by the camera.
In this second embodyment of the invention shown in figure 3, the camera 30 will collect graphical information of the users thumb grip 70, i.e. the index finger and the thumb (see figure 3).
Movement of the thumb grip relative to the camera 30 will

control a graphical object, a cursor 80, that is shown on the display unit 20. The status of the thumb grip 70 can be open or closed. Note that the status can be position or a defined configuration of the users finger(s) or another object in the graphical information collected by the camera.

This embodyment of the invention is exemplified by a userinterface to an application that is used on the display unit 20 (see figure 3) of the dataprocessing unit 10. The user interface contains for instance objects that can be moved, buttons or menu choices.

The camera 30 is directed towards the users thumb grip 70 (see FIG 2).
The picture of the thumb grip 70 and a reference point 80 (e.g. a graphical object in the form of a cross) is shown on the display unit 20 (see figure 2). The cross is not affected by the movement of the thumb grip. A point on the thumb grip 90 is defined as a reference for the position of the thumb grip in the graphical information from the camera relative to its position in the graphical object in the display unit 20. This is achived by placing the thumb grip 70 so that a specific point, the point 90 is positioned at the reference point 80. Thereafter the reference is locked, preferably by pressing a button on the dataprocessing unit 10 that will send a signal to software in the dataprocessing unit 10.

Graphical information from the camera will now be analyzed by the means of software in the dataprocessing unit 10 with respect to the movement and status of the thumb grip 70. Status is defined as "open" if a certain distance is detected between the thumb and the index finger. Status is defined as "closed" if no distance is detected between the thumb and the index finger.

The result of the analysis will be three values that represents:

- The movement of the thumb grip along the x-axis
- The movement of the thumb grip along the y-axis
- The status of the thumb grip (open or closed)

In a suitable way a switchover will be made so that the display unit 20 will show the above mentioned userinterface (see figure 3). A cursor symbol 100, is shown on the display unit 20 as a formalized picture of the thumb grip 70. This also reflects the status of the thumb grip. In this example the status is "closed".

The above mentioned data values are used as input values to routines in the software of the dataprocessing unit 10, that controls movement of the cursor and also that controls the function that represents the pressing the buttons on a conventional computer mouse. The user can now move the cursor symbol 100 by moving the thumb grip 70 relative to the camera 30. Further more the user can "grab" objects in the user interface by "closing" the thumb grip 70 when the cursor symbol 100 is over the object on the display unit 20.

The user can pan a graphical object on the display unit 20 in the following way:
-"close" the thumb grip 70 on a point in the graphical object.
-Move the thumb grip 70 with the status kept as "closed". (The graphical object in the display unit 20 will be panned).
-Change status of the thumb grip 70 to "open".

Detection of lightcontrasts

In this embodyment of the invention graphical information that is collected by the camera (30) is analyzed with respect to changes in light contrast. The camera 30 is in this example directed towards an object that emitts dots of light. This graphical information is collected by the camera connected to/integrated with the dataprocessing unit. The light dots in the graphical information will be analyzed in the dataprocessing unit with respect to their position and status. Status is either "on" or "off". The result of this analysis will be one value per light dot that represents its status. Every light dot will be given an id (ID). On the display unit 20 a graphical object will be shown that represents the ID of each light dot and its respective status.

An example of such an object would be a control panel in for instance a factory were light bulbs represents the status of a process in the factory. Values for each light bulb on the panel will be collected in the dataprocessing unit 10 and can be processed, presented on for example the display unit in the dataprocessing unit 10 and also be transmitted further on.

Another example is a panel with holes through wich light flows from a lightsource placed behind the panel as seen from the camera. The user can cover the holes and in this way change status on individual light dots. Analysis in the dataprocessing unit gives a datavalue per light dot (hole in the panel) in the graphic information that has been collected by the camera. The datavalue represents status covered or not covered. The datavalue can be showed in the display. Each hole can represent a letter or a digit on a keyboard. Hence the invention supports input of text to the dataprocessing unit.

Keyboard

The purpose of this embodiment is to enable a quick input of characters (letters and digits) and computergraphical objects (lines and figures) using none or a minimum of components or external devices.

It is presumed as unpractical to supply the dataprocessing unit with a keyboard used for personal computers (PC).

See figure 4. The camera 30 (connected to the dataprocessing unit 10) is aimed at a papercopy 110 containing an image. In this example there are a number of keys and an area 130 for input of computer graphical drawings. The keys are in contrast to the background.

Using preferable the index finger, the user points to one of the keys on the papercopy. An analysis of the information captured by the camera will give a computer value for each key, corresponding to "key pressed" or "key not pressed". This analysis consists primarily of detecting a change in contrast created when a finger covers a key 120 on the papercopy. The input sequence of data values will be shown on the display unit 20 as a sequence of signs in a computer graphic image.

In addition, the user may also create, for example line information etc., preferably by placing his thumb grip in parallel to and in contact with, a for this purpose designated part of the paper copy, in this example the area 130. The user's thumb grip may then be used as a pointing device in the previous described function "Pointing device function by means of the thumb-index finger grip".
The thumbgrips movements and statut is analyzed. When the thumb grip is closed, its movement creates computer

values corresponding to a line. The line will be represented as a part of a computer graphic object shown on the display 20.

Note that the layout, shape and design of the papercopy used when performing the data input, is not in any way limited to the one descibed in this example.

In this example a papercopy showing a keyboard is used. In other embodiments a picture projected on a surface can be used. The projection can for example be created by a device, integrated in the dataprocessing unit, projecting an image on a surface.

Finally it should be noted that the present invention is not in any way limited to the method mentioned above. On the contrary many modifications are feasible within the limits of the enclosed claims.
For example instead of the thumbgrip, a pen or another object may be used to produce the cursor symbol on the display integrated in the dataprocessing unit.

CLAIMS

1. A method for controlling a display (20) included in a data processing unit (10), characterized in that

- a first (51) and a second (52) image information is captured to said data processing unit (10) by a camera (30) comprised in said data procesing unit (10);
- a difference between said first (51) and second (52) image information is detected;
- a computer graphic image object (41) shown on said display (20) is changed in accordance with said difference.

2. A method according to claim 1, characterized in that said difference between said first (51) and second (52) image information is a difference in relative position between the camera (30) and an object visible through the camera's lens.

3. A method according to claim 1 - 2, characterized in that said computer graphic image object (41) changes position.

4. A method according to claim 1 - 3, characterized in that the change of said computer graphic image object is a panning.

5. A method according to claim 1 - 3, characterized in that the change of said computer graphic image object is a zooming.

6. A method according to claim 1 - 2, characerized in that said computer graphic image object (41) changes status.

7. A method according to any preceding claim, characterized in that a third image information is captured to said data processing unit (10) by the camera (30) comprised in said data processing unit (10).

8. A method according to claim 7, characterized in that

- a difference between said first, second, and third image information is detected;
- said difference between said first, second, and third image information is represented by a set of data values which are filtered in the data processing unit (10);
- said image object is changed in accordance with the result of the filtering of said data values.

9. A method according to claim 8, characterized in that said filtering is a of low-pass type filtering.

10. A method according to claim 8, characterized in that said filtering is achieved by means of hysteresis effect.

11. A method according to any preceding claim, characterized in that said data processing unit (10) is a mobile data processing unit.

12. A method according to any preceding claim, characterized in that said camera (30) is a digital camera.

13. A data processing unit (10) comprising a display (20) and a camera (30) for capturing a first and a second image information, characterized in that said data processing unit (10) comprises means for detecing a difference between said first (51) and second (52) image information and a means for changing a computer

graphic image object (41) shown on said display (20) in accordance with said difference.

14. A data processing unit (10) comprising a display (20) and a camera (30) for capturing a first and a second image information, characterized in that said data processing unit (10) comprises means for detecing a difference between said first (51) and second (52) image information and means for panning a computer graphic image object (41) shown on said display (20) in accordance with said difference.

15. A data processing unit (10) comprising a display (20) and a camera (30) for capturing a first and a second image information, characterized in that said data processing unit (10) comprises means for detecting a difference between said first (51) and second (52) image information and means for zooming a computer graphic image object (41) shown on said display (20) in accordance with said difference.

16. A dataprocessing unit (10) according to any one of the claims 13 - 15, characterized in that said data processing unit (10) is a mobil terminal.

17. A data processing unit (10) according to any one of the claims 13 - 16, characterized in that said camera (30) is a digital camera.

Fig. 1

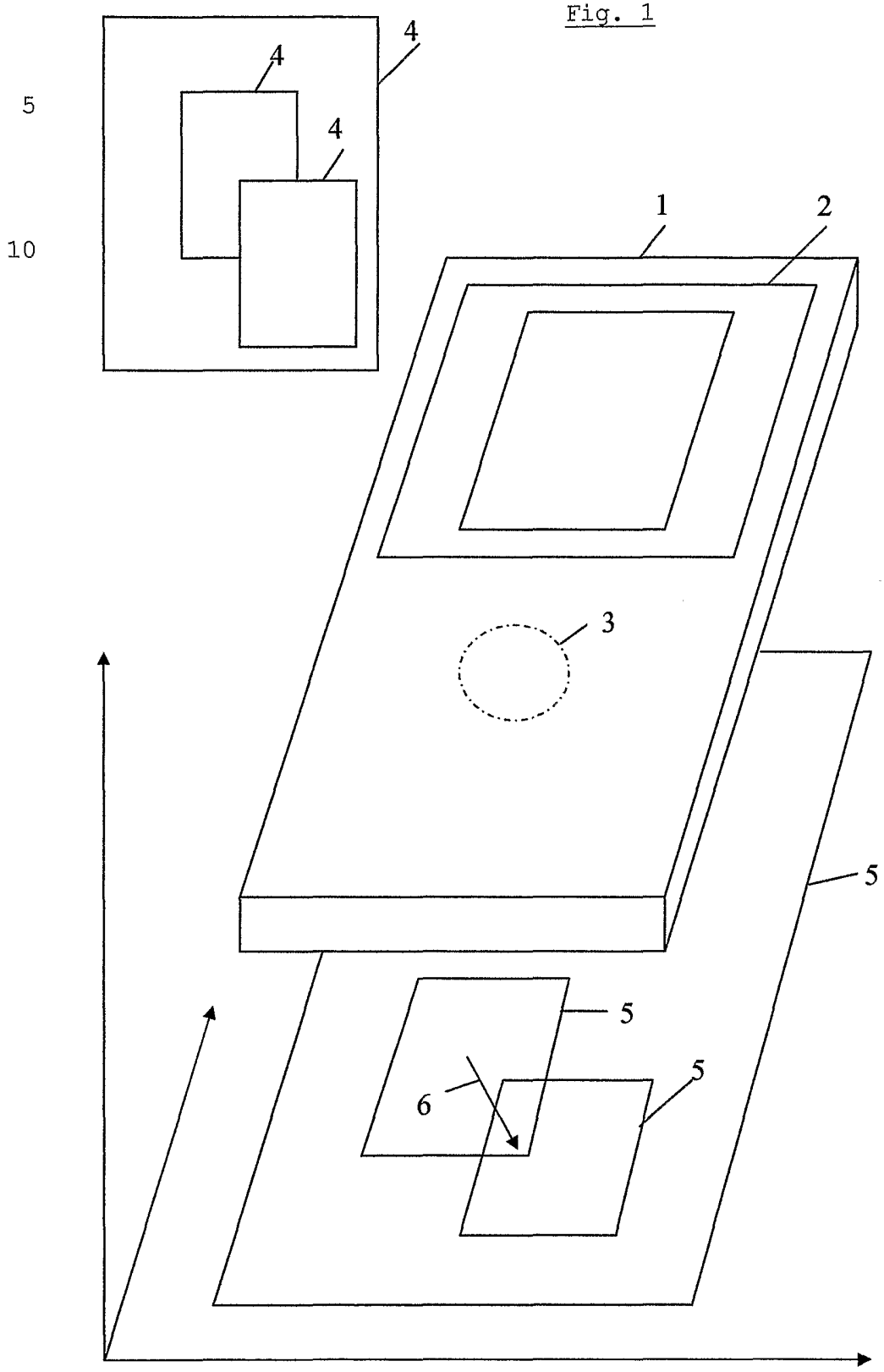


Fig. 2

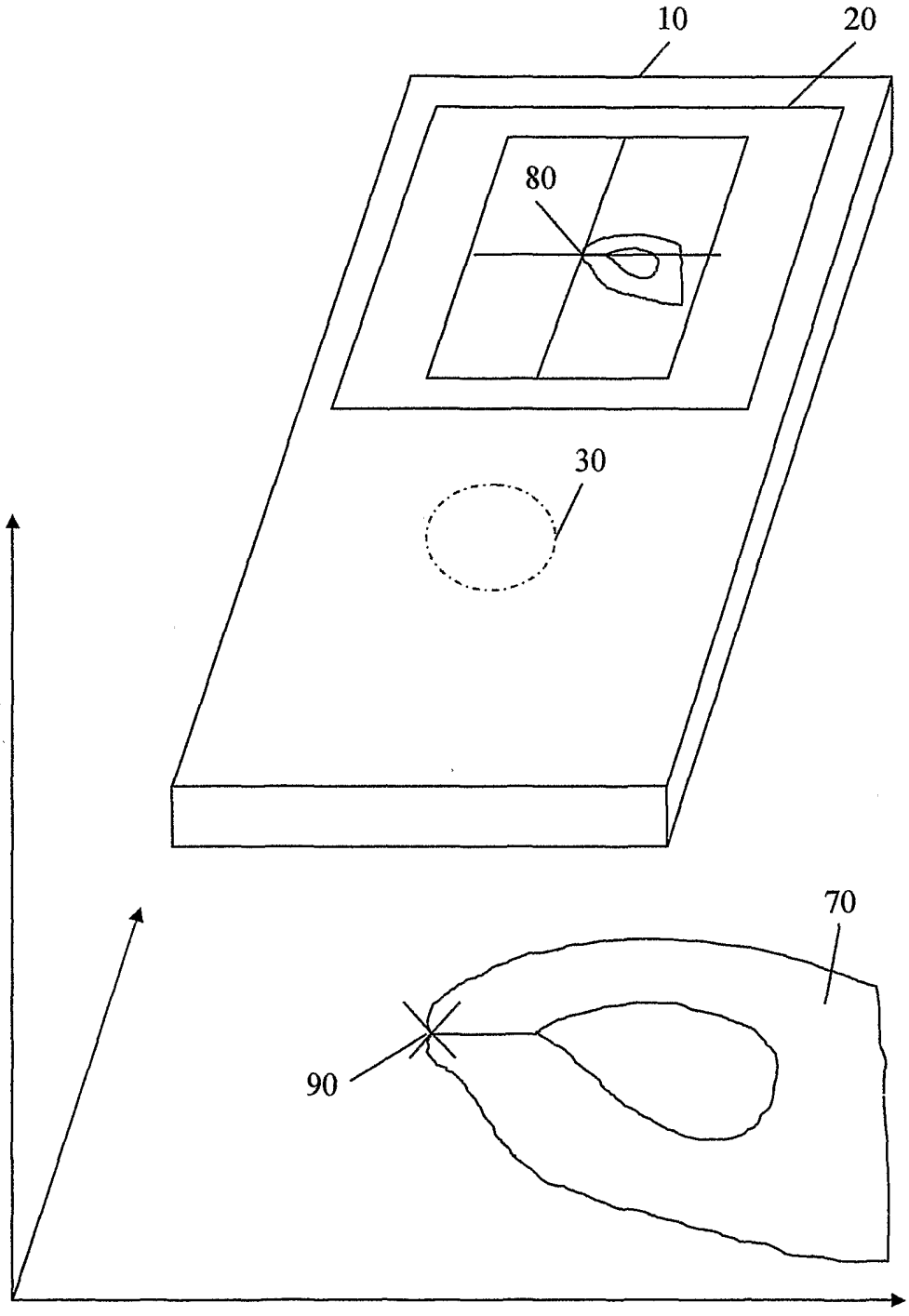


Fig. 3

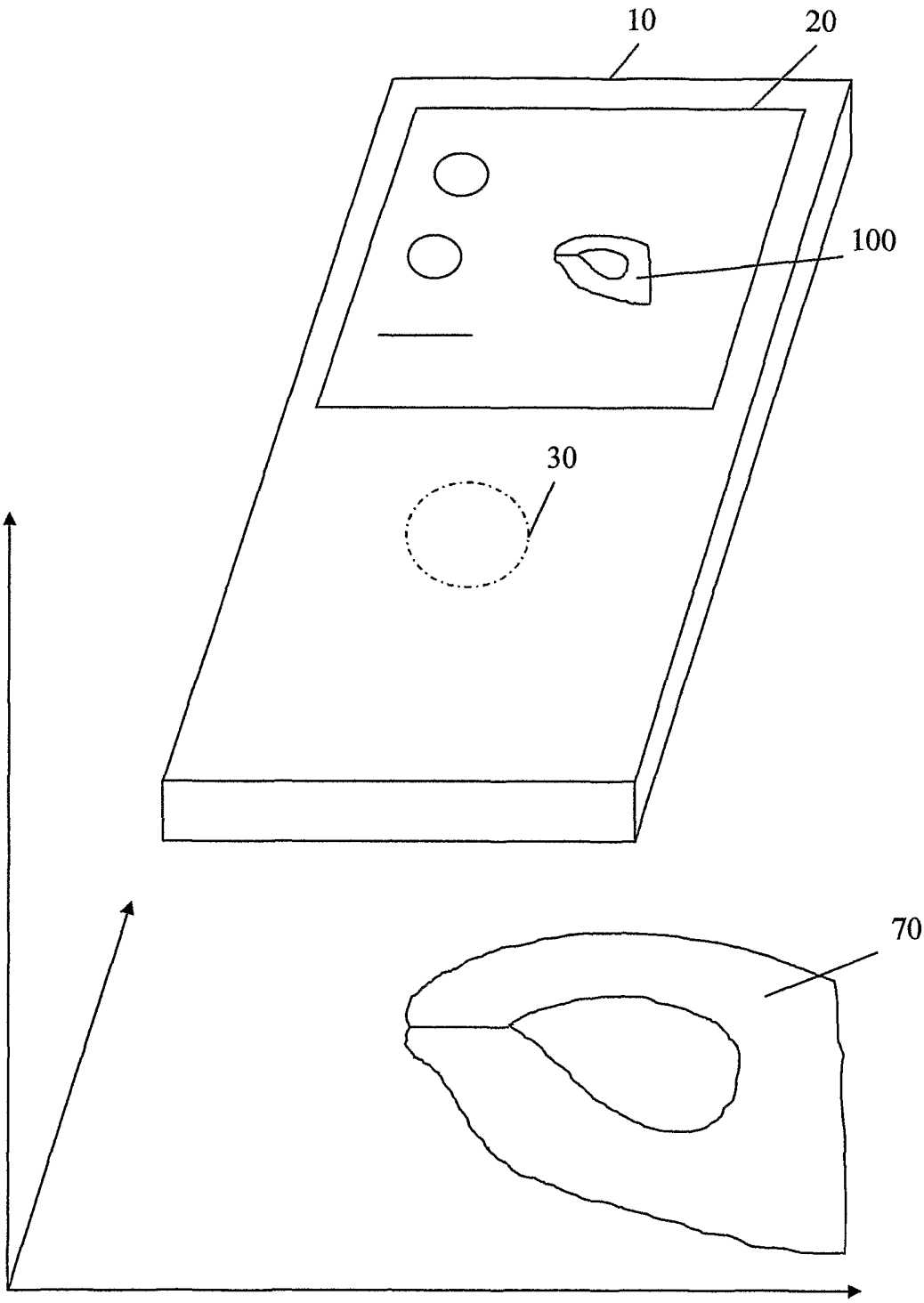
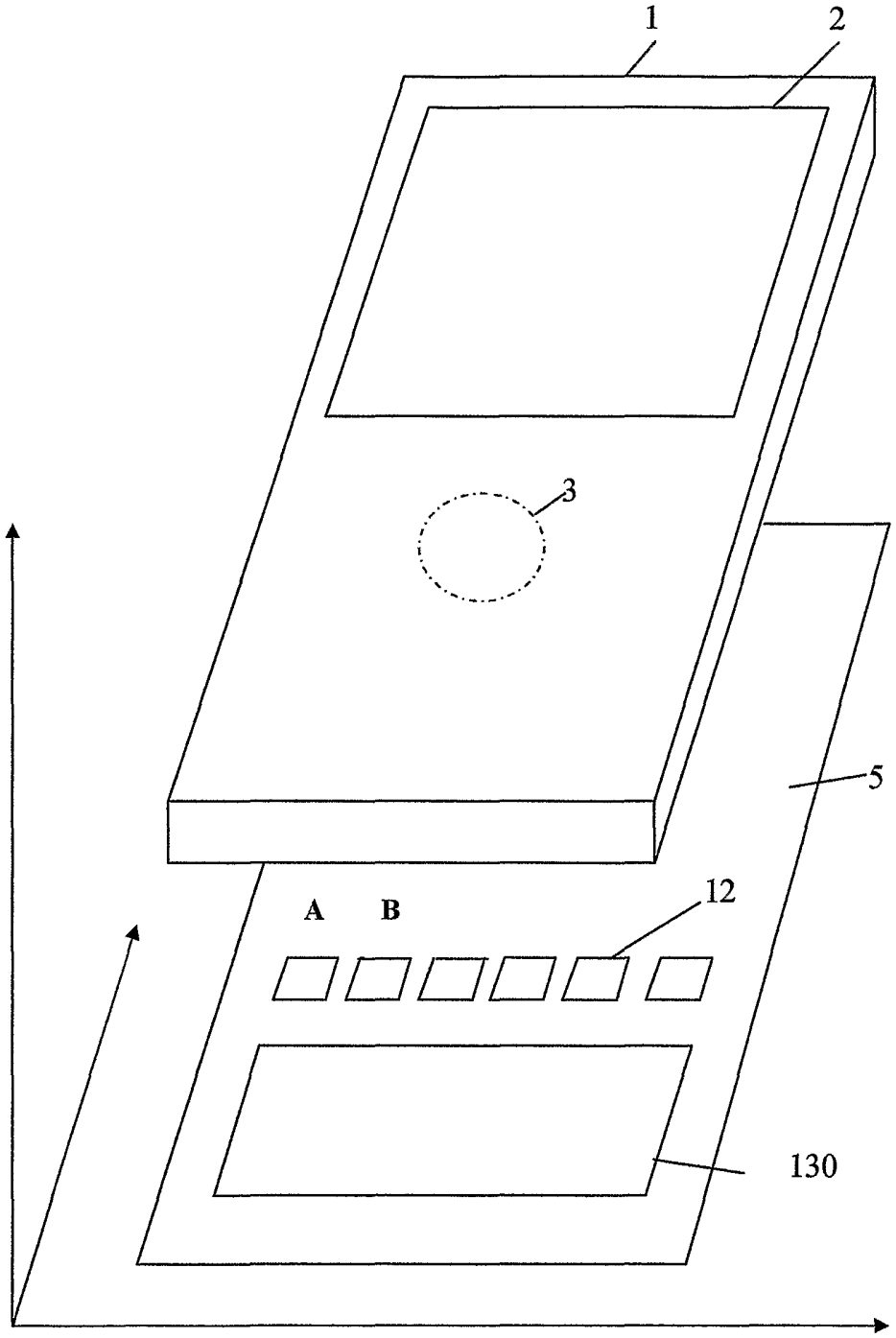


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2005/000510

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: 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)

IPC7: G06F, G09G

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9960468 A1 (C TECHNOLOGIES AB), 25 November 1999 (25.11.1999)	1-17
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E	SE 525935 C2 (LARS KARLQVIST), 31 May 2005 (31.05.2005)	1-17
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"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
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 November 2005	22-11-2005
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Jan Silfverling Telephone No. +46 8 782 25 00

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Continuation of cover sheet

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