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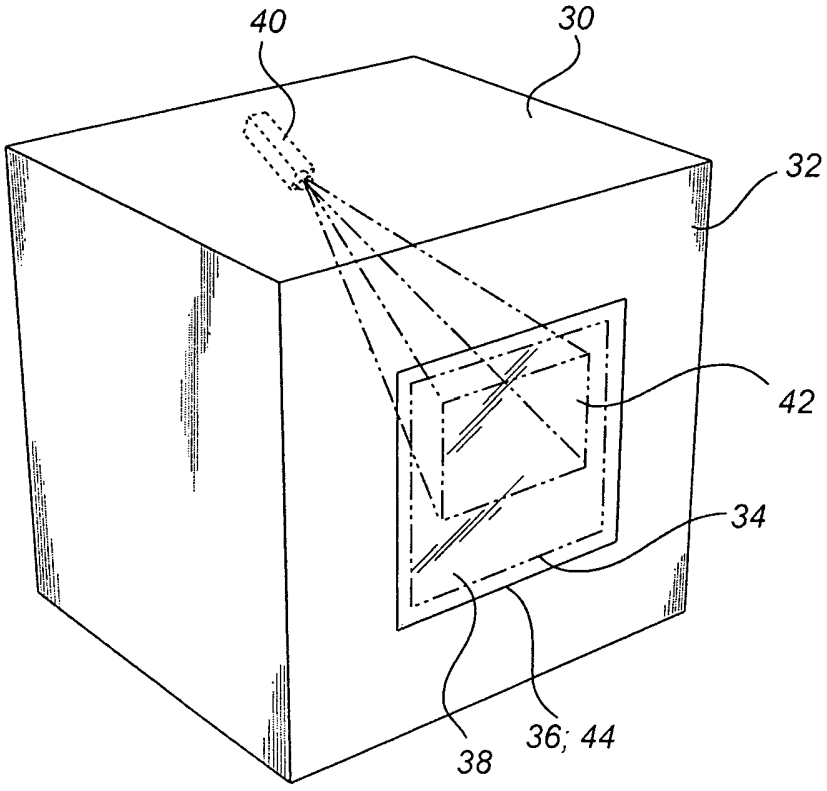
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(54) **Title:** HOUSEHOLD APPLIANCE HAVING CONCEALABLE USER INTERFACE



(57) **Abstract:** The present invention relates to a household appliance (10; 30) comprising a user interface (14; 42), a plate (16; 36), and means for adjusting the transparency of the plate (16; 36), between essentially transparent and essentially non-transparent. The user interface and plate are so arranged in relation to each other that the user interface is essentially concealed for a user when the plate is essentially non-transparent. Thereby, the user interface can be concealed for example when not in use.

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Household appliance having concealable user interface

Technical field

The present invention relates to a household appliance, such as a refrigerator, oven, or laundering machine, having a concealable user interface.

Technical background

Household appliances such as ovens and laundering machines are traditionally equipped with a user interface that permits a user to control the appliance. The user interface is usually placed on the front side of the appliance, and can comprise an information display and/or a keyboard or user operable buttons or protruding knobs. However, the presence of such user interface can make the household appliance difficult to clean, and it also restricts the design possibilities of the appliance.

Summary of the invention

It is an object of the present invention to overcome or at least alleviate these problems, and to provide an improved household appliance. This and other objects that will be evident from the following description are achieved, according to one aspect of the invention, by means of a household appliance comprising a user interface, a plate, and means for adjusting the transparency of the plate between essentially transparent and essentially non-transparent, wherein the user interface and plate are so arranged in relation to each other that the user interface is essentially concealed for a user when the plate is essentially non-transparent.

By using a plate having variable transparency, the user interface can be concealed for example when the appliance or user interface is not in use. The plate having variable transparency can for example be achieved by means of suspended particle devices, liquid crystals or electrochromic techniques.

The plate can for example be a glass plate. Alternatively, the plate can be made of plastics or any other suitable material. In one embodiment of the invention, the user interface is a physical user interface, and the plate is positioned to cover the physical user interface. The physical user interface can for example comprise a conventional LED or LCD based display and/or a keyboard or the like. The plate can be flexible to allow push commands from a user preformed on the plate to be transferred to any

push-buttons of the underlying physical user interface. Alternatively, other known under glass techniques can be used. By arranging the plate so that it covers the physical user interface, the physical user interface can be concealed when the plate is in the essentially non-transparent state, for example when the household appliance is not in use. Also, no protruding buttons or knobs have to be used. Preferably, the means for adjusting the transparency of the plate, i.e. the concealing of the user interface, can be controlled automatically and/or manually.

In another embodiment of the invention, the user interface is a virtual user interface, and the household appliance further comprises means for projecting the virtual user interface onto the plate.

It should be noted that virtual user interfaces are known per se, for example from the document US6650318.

By projecting the user interface onto the plate of the household appliance, there is no need for any protruding buttons or knobs, which in turn for example facilitates the cleaning of the household appliance. Also, it becomes possible to temporarily present a large user interface on the household appliance, which large user interface is easy to use especially for short-sighted persons. Further, since the user interface is not limited to a physical layout, the virtual user interface can be altered or extended or reduced depending on for example what functions that are currently needed to command the household appliance, thereby increasing the flexibility.

Preferably, the projection means is adapted to project from within the household appliance, whereby the virtual user interface is back-projected onto the plate. The plate can for example form part of a window of the appliance. The projection means can for example be positioned inside the appliance, and the virtual user interface can be projected when the plate is in its essentially transparent state. By this, it becomes possible to have a complete flat front on the household appliance without any physical/visible user interface parts. Further, it should be noted that the aspect of back-projecting the virtual user interface also can be used with a regular constantly essentially transparent plate.

The household appliance can further comprise means for detecting an action performed by a user on the user interface and for generating signals in response to the action, and means, connected to the detection means, for performing an operation of

the household appliance in response to the signals. The detection means can for example be an optical position sensing device, such as a camera, photodiodes (such as IR) or other proximity sensors, or a touch sensitive device at least partly incorporated in and/or outside the plate for detecting what action the user performs on the physical or virtual user interface.

The term household appliance should be construed as a device or piece of equipment designed for use is a home or for performance of domestic chores. The household appliance can for example be an oven, a microwave oven, a refrigerator, a freezer, a dishwasher, a laundering machine, or a tumbler dryer. Further, the plate being essentially transparent should be construed as any bodies lying beyond are seen clearly, while essentially non-transparent should be construed as any bodies lying beyond are not seen clearly or not seen at all.

According to another aspect of the invention, there is provided a household appliance comprising means for projecting an interactive virtual user interface onto an at least temporarily essentially transparent plate of the household appliance, means for detecting an action performed by a user on the virtual user interface and for generating signals in response to the action, and means, connected to the detection means, for performing an operation of the household appliance in response to the signals.

According to yet another aspect of the invention, there is provided a method for providing an interactive virtual user interface on a household appliance, which method comprises providing an at least temporarily essentially transparent plate on the household appliance, projecting an interactive user interface on the plate, and detecting an action performed by a user on the virtual user interface.

Brief description of the drawings

These and other aspects of the present invention will now be described in more detail, with reference to the appended drawings showing currently preferred embodiments of the invention.

Fig. 1 is a schematic perspective view of a household appliance according to an embodiment of the invention, and

Fig. 2 is a schematic perspective view of a household appliance according to another embodiment of the invention.

Detailed description of currently preferred embodiments of the invention

Fig. 1 shows a household appliance 10 according to an embodiment of the invention. The household appliance 10 can be an oven, a microwave oven, a refrigerator, a freezer, a dishwasher, a laundering machine, a tumbler dryer, etc. On the front side 12 of the appliance 10, there is provided a physical user interface 14. The user interface 14 can comprise a display, such as a LED or LCD display, for showing information related to the operation of the appliance 10, for example remaining running time, selected setup, setup options, etc. The user interface can further comprise a keyboard or keypad for allowing a user to input instructions in order to control the appliance 10, i.e. an interactive user interface.

The household appliance 10 further comprises a plate 16, e.g. a glass plate, which covers the user interface 14. The plate 16 has a variable transparency, ranging from essentially transparent to essentially non-transparent.

Thus, on one hand the user interface 14 can be concealed when the plate 16 is essentially non-transparent, and on the other hand it becomes visible when the plate 16 is essentially transparent.

The transparency of the plate 16, i.e. the concealing/revealing of the user interface 14 can be controlled automatically. For example, the plate can become transparent when the working cycle of the appliance is finished, thereby revealing the user interface and allowing a user to recognize that the working cycle has come to an end. Alternatively, or as a complement, the transparency of the plate 16 can be controlled manually by a user by means of a single control switch (not shown) incorporated in the appliance 10. The control switch could for example be implemented as a touch sensitive area on the plate or the appliance, so that touching that area alters the transparency of the plate.

Optionally, the appliance 10 can comprise an opening 18 covered by a glass plate 20 of essentially the same type as the above mentioned plate 16. When the plate 20 is transparent, a user can inspect the interior and contents of the household appliance 10, for example the food kept in a refrigerator or the laundry in a laundering machine, without having to open up the appliance. On the other hand, when the plate 20 is non-

transparent, the contents of the appliance 10 is concealed from outside view. Here, the plates 16 and 20 can be constituted by one single plate covering both the user interface 14 and the opening 18. The plate 20 or the combined plate 16, 20 can form part of a door of the household appliance 10.

In case the user interface 14 comprises a keyboard or buttons or the like for input of user instructions, such buttons can be push-buttons, whereby the plate 16 preferably is flexible to allow push commands from a user preformed on the plate 16 to be transferred to the buttons of the underlying user interface 14. Alternatively, the keyboard can for example be shown on a display of the user interface 14 or just being printed on the user interface 14, whereby an action performed by a user on the keyboard can be detected for example by an optical position sensing device, such as a camera or photodiodes (not shown), or a touch sensitive device at least partly incorporated in and/or outside the plate 16. An operation of the household appliance 10 related to the detected user action is then performed accordingly.

Fig. 2 shows a household appliance 30 according to another embodiment of the invention. As above, the household appliance 30 can be an oven, a microwave oven, a refrigerator, a freezer, a dishwasher, a laundering machine, a tumbler dryer, etc. On the front side 32 of the household appliance 30, there is provided an opening 34 covered by a plate 36, such as a glass plate. That is, the household appliance 30 is provided with a window 38.

The household appliance further comprises means 40 for projecting a virtual user interface 42 onto the plate 34. Here, the projection means 40 is positioned inside the household appliance 30 in order to project from within the appliance, whereby the virtual user interface 42 is back-projected onto the plate 34.

The plate 34 can form part of a door of the household appliance 30. Further, the virtual user interface 42 can comprise both an information display and a keyboard or a keypad or the like, i.e. an interactive user interface. An action performed by a user on the keyboard can be detected for example by an optical position sensing device, such as a camera or photodiodes (not shown), or a touch sensitive device at least partly incorporated in and/or outside the plate 36. An operation of the household appliance 30 related to the detected user action is then performed accordingly.

The projected virtual user interface and related detection means can for example be realised as described in the above mentioned document US6650318, which document is hereby incorporated by reference.

The plate 36 can have a variable transparency, ranging from essentially transparent to essentially non-transparent. When the plate is transparent, the virtual user interface 42 (as well as the interior of the appliance) is visible, while when the plate is non-transparent, the virtual user interface 42 (and the interior of the appliance) is concealed. As in the embodiment described above in relation to fig. 1, the transparency of the plate 36 can be controlled automatically and/or manually. Further, the presence of the virtual user interface 42 can be controlled by switching the projection means 40 on or off.

As an alternative to the plate having variable transparency, the plate forming part of the window 38 can be a regular constantly essentially transparent (glass) plate 44. In this case, the projection means 40 can be turned on/off in order to "reveal"/"conceal" the virtual user interface 42.

The person skilled in the art realizes that the present invention by no means is limited to the preferred embodiments described above. On the contrary, many modifications and variations are possible within the scope of the appended claims.

Claims

1. A household appliance (10; 30), comprising a user interface (14; 42), a plate (16; 36) and means for adjusting the transparency of the plate (16; 36), between essentially transparent and essentially non-transparent,

wherein the user interface and plate are so arranged in relation to each other that the user interface is essentially concealed for a user when the plate is essentially non-transparent.

2. A household appliance (10) according to claim 1, wherein the user interface is a physical user interface (14), and wherein the plate (16) is positioned to cover the physical user interface.

3. A household appliance according to claim 2, wherein the plate (16) is flexible.

4. A household appliance (30) according to claim 1, wherein the user interface is a virtual user interface (42), and wherein the household appliance further comprises: means (40) for projecting the virtual user interface onto the plate (36).

5. A household appliance according to claim 4, wherein the projection means (40) is adapted to project from within the household appliance, whereby the virtual user interface (42) is back-projected onto the plate (36).

6. A household appliance according to claim 2 or 4, further comprising:
means for detecting an action performed by a user on the user interface, and for generating signals in response to the action, and means, connected to the detection means, for performing an operation of the household appliance in response to the signals.

7. A household appliance according to claim 6, wherein the detection means is an optical position sensing device.

8. A household appliance according to claim 6, wherein the detection means is a touch sensitive device, which touch sensitive device is at least partly incorporated in and/or outside the plate.

9. A household appliance according to claim 1, wherein the household appliance (10; 30) is at least one of an oven, a microwave oven, a refrigerator, a freezer, a dishwasher, a laundering machine, and a tumbler dryer.

10. A household appliance according to claim 1, wherein the user interface (14; 42) comprises at least one of a keyboard and an information display.

11. A household appliance, comprising means for projecting an interactive virtual user interface onto an at least temporarily essentially transparent plate of the household appliance, means for detecting an action performed by a user on the virtual user interface, and for generating signals in response to the action, and means, connected to the detection means, for performing an operation of the household appliance in response to the signals.

12. A household appliance according to claim 11, wherein the projection means is adapted to project from within the household appliance, whereby the virtual user interface is back-projected onto the plate.

13. A method for providing an interactive virtual user interface on a household appliance, comprising:

providing an at least temporarily essentially transparent plate on the household appliance,

projecting an interactive user interface on the plate, and

detecting an action performed by a user on the virtual user interface.

14. A method according to claim 13, wherein the virtual user interface is projected from within the household appliance onto the plate.

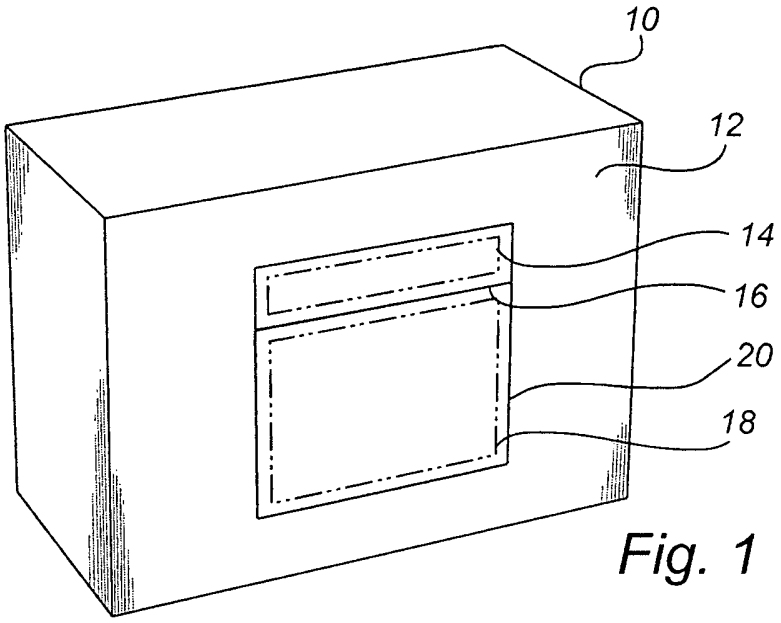


Fig. 1

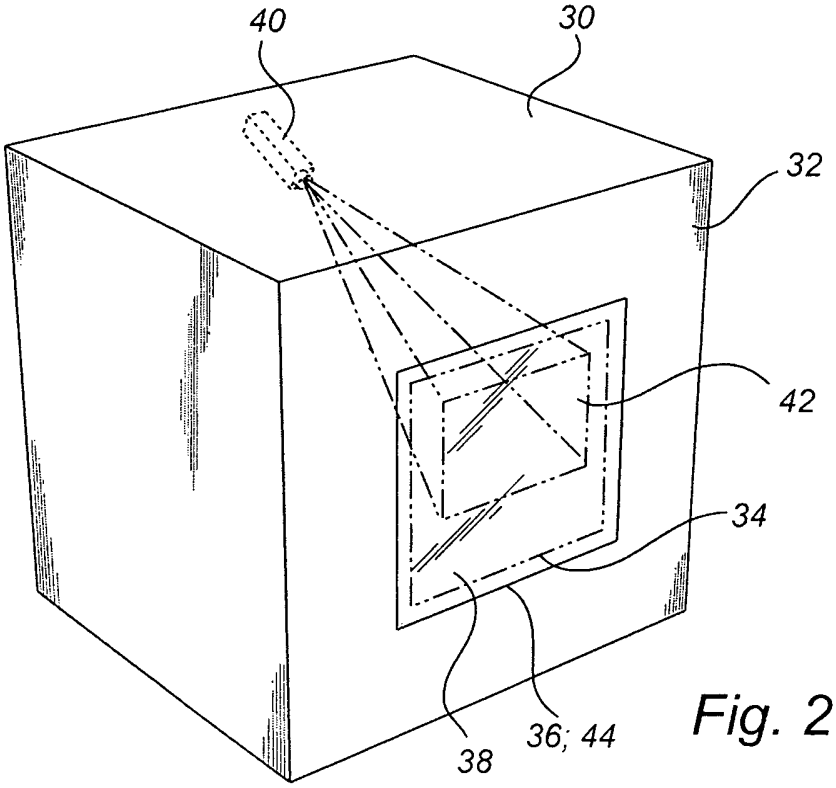


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/005207

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F1/16 G06F3/042

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)
G07F G06F F24C

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, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 101 31 010 A1 (INFINEON TECHNOLOGIES AG) 23 January 2003 (2003-01-23) the whole document	1-3,9,10
Y		4-8
X	EP 0 782 307 A (NOKIA MOBILE PHONES LTD) 2 July 1997 (1997-07-02) column 2, line 23 - column 3, line 20; figure 1 column 4, line 24 - column 5, line 19; figures 8,9	11-14
Y		4-6,8
X	US 6 061 177 A (FUJIMOTO ET AL) 9 May 2000 (2000-05-09) abstract; figures 3,4	11-14

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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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
16 August 2006	25/08/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Schröter, P

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/005207

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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