An effective method for the display of a plurality of useful windows within the display of a digital information device. A form of tabbed window, called a "MetaView" permits users define the location and size of a window by a single interaction with a MetaView tab. The invention offers improved utilization of screen real estate, and increased user convenience in accessing multiple window displays.
| AC | Albania                     | AL  | ALB                           | AM | Armenia                   | AM  | ARM                           | AT | Austria                     | AU  | Australia                  | AZ | Azerbaijan                  | BA  | Bosnia and Herzegovina    | BB  | Barbados                   | BE  | Belgium                    | BF  | Burkina Faso               | BG  | Bulgaria                   | BJ  | Benin                       | BR  | Brazil                      | BY  | Belarus                    | CA  | Canada                      | CF  | Central African Republic   | CG  | Congo                       | CH  | Switzerland                | CI  | Côte d’Ivoire               | CM  | Cameroon                    | CN  | China                       | CU  | Cuba                        | CZ  | Czech Republic              | DE  | Germany                     | DK  | Denmark                     | EE  | Estonia                     | ES  | Spain                        | FI  | Finland                     | FR  | France                      | GA  | Gabon                       | GB  | Georgia                    | GH  | Ghana                       | GN  | Guinea                      | GR  | Greece                      | HU  | Hungary                     | IE  | Ireland                    | IL  | Israel                      | IS  | Iceland                    | IT  | Italy                       | JP  | Japan                       | KE  | Kenya                       | KG  | Kyrgyzstan                  | KP  | Democratic People’s Republic of Korea | KR  | Republic of Korea         | KZ  | Kazakhstan                  | LC  | Saint Lucia                 | LI  | Liechtenstein               | LK  | Sri Lanka                   | LR  | Liberia                     | LS  | Lesotho                      | LT  | Lithuania                   | LU  | Luxembourg                  | LV  | Latvia                      | MC  | Monaco                      | MD  | Republic of Moldova         | MG  | Madagascar                 | MK  | The former Yugoslavia      | ML  | Mali                        | MN  | Mongolia                    | MR  | Mauritania                  | MW  | Malawi                      | MX  | Mexico                      | NE  | Niger                       | NL  | Netherlands                 | NO  | Norway                      | NZ  | New Zealand                 | PL  | Poland                      | PT  | Portugal                    | RO  | Romania                     | RU  | Russian Federation          | SD  | Sudan                       | SE  | Sweden                      | SG  | Singapore                   | SI  | Slovenia                     | SK  | Slovakia                    | SN  | Senegal                     | SZ  | Swaziland                   | TD  | Chad                        | TG  | Togo                        | TJ  | Tajikistan                  | TM  | Turkmenistan                | TR  | Turkey                      | TT  | Trinidad and Tobago         | UA  | Ukraine                     | UG  | Uganda                      | US  | United States of America    | UZ  | Uzbekistan                  | VN  | Viet Nam                    | YU  | Yugoslavia                  | ZW  | Zimbabwe                    |

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METHOD AND APPARATUS FOR SIMULTANEOUSLY RESIZING AND RELOCATING WINDOWS WITHIN A GRAPHICAL DISPLAY

FIELD OF THE INVENTION

This invention relates to methods and apparatus for organizing and processing information, and more particularly, to computer-based graphical user interface-driven methods minimizing the input steps users must take to simultaneously and conveniently reposition and resize frames of output within a digital computer's graphic display.

BACKGROUND

Windows have become the central element of the now ubiquitous graphical interfaces dominating virtually every user's computer experience. Based on a paper metaphor, they permit users intuitively to switch amongst active computer programs, documents and tasks. Yet every user is familiar with the limitations of prior windows interfaces stemming from the confusion which often results from having too many windows open within the limited display space of computer monitors, and the constant resizing and repositioning required to organize the display of multiple windows. It is a purpose of the present invention to offer an improved method of displaying windows that frees the user from such confusion, and minimize the number of user interactions required to organize a computer display.

Users often have more than one window open at a time. Each window can be moved and resized. They can also be placed on top of one another. This makes windows extremely useful since they allow programs and users to organize everything on
the screen visually. The repositioning and resizing of windows allows users to give prominence to active computer files, while leaving inactive files accessible.

5 Windows are a useful metaphor permitting users simultaneous access to several computer documents or functions. However, multiple window schemes of the prior art suffer from certain well-known limitations. Namely, the utility of the prior art windowing are wasteful of the limited display space ("screen real estate") available within a computer's display, and fail to enable users adequately to switch amongst the contents of multiple windows. Specifically, in the prior art, windows are lost when other windows cover them up. The user has no convenient way of knowing that a window is "under" another window. Functions for the automatic arrangement of windows such as tiling (Fig. 1) and cascading (Fig. 2) waste screen real estate. As at least one commentator has noted, "Leaving an edge of one application’s rectangle peeking out from behind the active window is an egregious waste of precious pixels."

10 (ALAN COOPER, ABOUT FACE 70 (August, 1995)). When multiple windows need to be fully accessed, screen space is between them is wasted unless the user takes the time and effort to resize them manually. And lastly, the prior art offers the user no convenient method of switching quickly amongst multiple windows.

For the purposes of explaining the advantages of the present invention, we now offer a more detailed description of the shortcomings of prior art windowing systems. In the prior art, various attempts have been made to address individual aspects of the multiple window management and screen real estate, but none offers a single straightforward solution.
Window Arrangement Commands. The prior art offers users various automatic window location and sizing options to clean up windows into specific, predefined arrangements, such as the common tiling arrangements (Fig. 1) and cascading arrangements of the prior art (Fig. 2). Tiled windows are automatically laid out so that the edges of windows abut each other and screen space is divided up. This method solves the problem of lost windows, at the expense of functional room within the tiled windows, and screen real estate. No more than a few windows can be evenly tiled before none are accorded enough screen space to be useful. Cascading commands (Fig. 2) permit users to find a window that was lost and uniformly arrange windows, but they require users to reposition and resize all of their windows in order to find just one, and waste screen real estate by including non-useful edges of windows within the display.

Tabbed Windows. In their basic form, tabbed windows enable users to switch amongst multiple windows quickly (Fig. 3). However, only one of the tabbed windows can be displayed at a time. An extended implementation of tabbed windows implemented in computer programs such as PhotoShop™ by Adobe, allows the tabs to be dragged out of the containing window and expand into the window corresponding to the tab. But this just leads to the same problems inherent in any overlapping windows scheme.

Magnetic Windows. Magnetic windows address the problem of wasted screen space between fully displayed windows. When the edge of one window is dragged close to another, the window being moved “snaps” to the edge of the stationary window (Fig. 4). This is useful if the windows are not already next to each other, but fails when windows that are next to each other need
to be resized. Magnetic windows can be seen in several programs such as Adobe PhotoShop 4.0.

**Splitter Windows.** Splitter windows allow two windows to be resized at once by assigning them to a mutual edge (Fig. 5). This works well so long as the number of windows remains low and the windows do not need to be relocated. Docking windows, a variant upon splitter windows, can be detached to become like a regular window and then later re-attached. All of these schemes require separate user steps to size and position separate windows, and do not adequately function to conserve screen real estate.

**Task Bars.** Task bars, such as the Start bar in Microsoft’s Windows™ 95 interface, and other window switching commands and menus list all the open windows and allow the user to activate one by clicking on it (Fig. 6). This solves the problem of losing windows, but does not assist users wishing to view the full contents of multiple windows simultaneously.
BRIEF SUMMARY OF INVENTION

An effective method for the display of a plurality of useful windows within the display of a digital information device is disclosed. A form of tabbed window, called a "MetaView" permits users define the location and size of a window by a single interaction with a MetaView tab. The invention offers improved utilization of screen real estate, and increased user convenience in accessing multiple window displays.
BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a prior art tiled window.
Figure 2 illustrates a prior art cascading window.
Figure 3 illustrates a prior art tabbed window.
Figure 4 illustrates a prior art magnetic window.
Figure 5 illustrates a prior art splitter window.
Figure 6 illustrates a prior art task bar.
Figure 7 illustrates the basic architecture of a computer system for use in implementing one embodiment of the present invention.

Figure 8 illustrates a MetaView in accordance with the present invention.

Figure 9 illustrates a flow diagram for simultaneously sizing and locating windows in response to a single user interactive step under the present invention.

Figure 10 illustrates a MetaView during a user interaction, and the screen "areas" utilized under the present invention.

Figure 11 illustrates a MetaView resulting from a user interaction.

Figure 12 illustrates a MetaView resulting from a user.

Figure 13 illustrates four possible arrangements of screen "areas" based upon four possible locations of indicia within a MetaView.

Figure 14 illustrates a MetaView following an additional user interaction moving an additional tab to the new pane.

Figure 15 illustrates a MetaView following an additional user interaction making that tab its own pane.

Figure 16 illustrates a MetaView following an additional user interaction resizing an existing pane.
NOTATION AND NOMENCLATURE

The detailed descriptions which follow are presented largely in terms of display images, algorithms, and symbolic representations of operations of data bits within a computer memory. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art.

An algorithm is here, and generally, conceived to be a self consistent sequence of steps leading to a desired result. These steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It proves convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, images, terms, numbers, or the like. It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities.

In the present case, the operations are machine operations performed in conjunction with a human operator. Useful machines for performing the operations of the present invention include general purpose digital computers or other similar devices. In all cases, there should be borne in mind the distinction between the method operations of operating a computer and the method of computation itself. The present invention relates to method steps for operating a computer and processing electrical or other physical signals to generate other desired physical signals.
The present invention also relates to apparatus for performing these operations. This apparatus may be specially constructed for the required purposes, or it may comprise a general purpose computer selectively activated or reconfigured by a computer program stored in the computer. The algorithms, methods and apparatus presented herein are not inherently related to any particular computer. In particular, various general purpose machines may be used with programs in accordance with the teachings herein, or it may prove more convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these machines will appear from the description given below.
DETAILED DESCRIPTION OF THE INVENTION

General System Architecture

Figure 7 depicts the general architecture of a digital computer system 90 for practicing the present invention. Processor 100 is a standard digital computer microprocessor, such as a CPU of the Intel x86 series. Processor 100 runs system software 120 (such as Microsoft Windows®, Mac OS® or another graphical operating system for personal computers), which is stored on storage unit 110, e.g., a standard internal fixed disk drive. In accordance with the GUI of the present invention, the "MetaView" software 130, also stored on storage unit 110, includes computer program code for performing the tasks and steps described below, including the digital representation of the contents, locations and dimensions of MetaView tabs and windows, the display of those items, and the processing of such user manipulation of those items in accordance with the principles of the present invention.

Display output, including the visual graphical user interface ("GUI") discussed below, is transmitted from processor 100 to an output device such as a video monitor 140 for display to users. Users utilize input devices such as standard personal computer keyboard 150, cursor control device 160 (e.g., a mouse or trackball), touch-screen sensors on the monitor display, virtual reality gloves, voice input, or similar techniques to enter the GUI input commands discussed below, which are then transmitted to processor 100. Software for implementing MetaView may be stored in a variety of locations and in a variety of mediums, including without limitation, RAM, data storage 111, a network server, a fixed or portable hard disk drive, an optical disk, or a floppy disk.
Defining a MetaView

The graphical container of a plurality of windows and tabs corresponding to windows described herein is referred to as a "MetaView." In its simplest embodiment, the present invention functions as a single window, bearing a plurality of tabs, corresponding to a plurality of window displays which would result from a user interactively selecting those tabs. For example within the MetaView 81 shown in Figure 8, a user has interactively selected the Alpha tab 8b, and thus the Alpha window 82 subsumes the entire MetaView, obscuring the contents of windows Beta, Gamma and Delta, but leaving Beta 83, Gamma 84, and Delta 85 tabs corresponding to those windows visible. In the same manner, a user interactively selecting the Beta 83 tab would result in the contents of a Beta window to come to the top, obscuring the contents of Alpha, Gamma and Delta, leaving only the tabs Alpha 86, Gamma 84 and Delta 85 visible.

Expanding a Pane within a MetaView

Unlike a tabbed window, a MetaView enables a user to resize and relocate full windows corresponding to the tab, with a single user interaction. Using a single command, a user can define the size and location of a window. In order to size and locate a full window corresponding to the tab Gamma 84, a user interactively selects Gamma using cursor control device 160, drags Gamma 84 out of the title bar, (See, Fig. 10) and releases, (See, Fig. 11.) In this Fig. 10, if the cursor is released towards the left of the existing window (Area A which is below or to the left of the imaginary diagonal 113, for example), the area will be split horizontally (See, Fig. 11). If it is dropped closer to the top of the existing window (Area B which is above or to the right of the imaginary diagonal 113,
for example), the area will be split vertically (See Fig. 12). Figure 9 discloses a flow chart corresponding to one implementation permitting users to resize and relocate windows within a MetaView in which tabs are arranged on the top left.

For the purposes of this discussion, a pane is a MetaView window with a single title bar, containing one or more tabs. In some embodiments of the present invention, each pane, such as the one consisting of window Alpha 82 and tab Delta 85, and another consisting of window Gamma 112 and tab Beta 83 behaves like a tabbed window (figs. 14 and 15). In addition, for the purposes of determining the size and location of additional windows or panes, some panes will bifurcate themselves into Area A and Area B, for the purposes of determining location and size according to the flow chart of Figure 9.

Fig. 13 illustrates several possible arrangements 131-134 of the screen "areas" based upon different locations of indicia within a Metaview. The size and location to which tabs or windows may be expanded depends on whether tabs are displayed above or below windows. As Figure 13 illustrates, releasing the cursor in Area A will result in a horizontally oriented window within MetaView 131 or 132, and in MetaView 132, the tab corresponding to the manipulated window will share the title bar with the other tabs. Releasing the cursor in Area A will result in a vertically oriented window within MetaView 133 or 134, and in MetaView 134, the tab corresponding to the manipulated window will share the title bar with the other tabs.

**Common Panes**
Additional tabs can now be dragged to the newly created pane, by releasing the cursor within the new title bar (Fig. 14) or additional windows can be created by releasing the cursor within neither title bar (Fig. 15). In the MetaView illustrated by Figure 14, Beta 83 has been interactively selected by a user, dragged and released anywhere within title bar 115. As a result, tab beta 83 is added to pane Gamma 142. In another embodiment, rather than dropping a tab onto the title bar, a user releases a tab onto another tab to result in a single pane with multiple tabs. In that embodiment, multiple panes result from releasing a moved tab anywhere except on top of another tab.

Still more panes result from releasing a moved tab in a location that will not add it to another existing title bar. As shown in Figures 14 and 15, if the user, by means of control device 160, drags tab Beta 83 (See, Fig. 14) to location 152 (See, Fig. 15) and releases, a new pane 153 will be created, whose width is determined by its x coordinate, and whose depth is determined by the perimeter of the MetaView on top, and by the top of window Gamma 151 on the bottom.

**Manipulating Existing Panes**

Dragging and dropping titles can also be used to resize or relocate existing panes in the same manner as creating a window described above. If there is only one title in a pane, the pane can be resized or located by selecting the tab itself using cursor control 160, dragging the tab to the desired location, and releasing. For example, Figures 15 and 16 illustrate how a user can resize Gamma window 151 by using cursor control device 160 to select pane Gamma 84, drag it to a
location lower in the MetaView, and release. The result is a shorter pane Gamma 151 as seen in Figure 16.

**Manipulating Multiple Items Simultaneously**

Certain embodiments enable the resizing and relocating of panes containing multiple tabs, by implementing a common control indicium 141 (See, Fig. 14) For example, a user can resize tabbed pane 142 by using cursor control device 160 to select the common control indicium 141, drag it to a location lower in the MetaView and release. The result is a shorter tabbed pane 142 as seen in Figure 17.

Once again, in a MetaView structure displaying tabs on the top left or bottom right, if the common control is dropped closer to the left side of the pane in which it is contained than the top, then the split is horizontal. If the title is dropped closer to the top side of the pane in which it is contained than the left, then the split is vertical.

**Maximize**

It is possible to extend the MetaView system to include facilities for showing only one window at a time, much like the “maximize” and “restore” commands found in Microsoft Windows. With such a facility, the user can double click on a title or click a control to make the window cover the MetaView. In some embodiments, tabbing or task bar means could be employed to inform users of other available items while one MetaView window is maximized. In this maximizing embodiment, a distinct user command, such as a double click of control device 160 returns the MetaView to its previous state.
Other Variations

Detailed illustrations of an improved scheme of presenting graphical information within computer displays in accordance with the present invention have been provided above for the edification of those of ordinary skill in the art, and not as a limitation on the scope of the invention. Numerous variations and modifications within the spirit of the present invention will of course occur to those of ordinary skill in the art in view of the embodiments that have now been disclosed. For example, while in the described embodiment, the present invention is implemented for a GUI for general purpose computers, the present invention may also be effectively implemented for any information capable of the display of graphics. The scope of the inventions should, therefore, be determined not with reference to the above description, but should instead be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.
I claim:

1. A method for graphically presenting information in conjunction with a digital information device comprising the following steps:
   defining a plurality of windows within a viewable area of the display output of a digital information device, an indicium of each of which being accessible by a user;
   selecting any of said indicia in response to a user input and moving it to user specified coordinates within said viewable area;
   defining the size and location of subset of the viewable area within said area based upon said coordinates.

2. The method of claim 1, wherein the size and location of the additional space also depends upon the location in which the indicia are displayed.

3. The method of claim 1, wherein the indicia are tabs or other graphical areas, whose selection by users results in the display of a window occupying the entire viewable area or the entire subset of the viewable area.

4. The method of claim 3, wherein a multiple tab window results from a user selecting coordinates proximate to another tab.

5. The method of claim 1, wherein a window is resized and/or relocated based upon the user specified coordinates.

6. The method of claim 1 wherein the indicia are common control indicia corresponding to a window with multiple tabs.
7. The method of claim 1 wherein interactively selecting an indicium results in the expansion of a window display.

8. The method of claim 7 wherein interactively re-selecting the indicium results in the cessation of the window display.

9. An apparatus for graphically presenting information in conjunction with a digital information device comprising:
   means for providing a display output;
   means for defining a plurality of windows within a viewable area of the display output of a digital information device, an indicium of each of which being accessible by a user;
   means for selecting any of said indicia in response to a user input and moving it to user specified coordinates within said viewable area;
   means for defining the size and location of subset of the viewable area within said area based upon said coordinates.

10. The apparatus of claim 9, wherein the size and location of the additional space also depends upon the location in which the indicia are displayed.

11. The apparatus of claim 9, wherein the indicia are tabs, whose selection by users results in the display of a window occupying the entire viewable area or the entire subset of the viewable area.

12. The method of claim 11, wherein a multiple tab window results from a user selecting coordinates proximate to another tab.
13. The apparatus of claim 9, wherein a window is resized and/or relocated based upon the user specified coordinates.

14. The method of claim 9 wherein the indicia are common control indicia corresponding to a window with multiple tabs.

15. The apparatus of claim 9 wherein interactively selecting an indicium results in the expansion of a window display.

16. The method of claim 15 wherein interactively re-selecting the indicium results in the cessation of the window display.

17. A computer program product comprising a computer useable medium having computable readable code embodied therein for graphically presenting information in conjunction with a digital information device, the code comprising:

- a module configured to define a plurality of windows within a viewable area of the display output of a digital information device, an indicium of each of which being accessible by a user;

- a module configured to select any of said indicia in response to a user input and moving it to user specified coordinates within said viewable area;

- a module configured to define the size and location of subset of the viewable area within said area based upon said coordinates.

18. A system for graphically presenting information in conjunction with a digital information device comprising:

- a processor;

- a user input device;
a memory device;
means for providing a display output;
means for defining a plurality of windows within a
viewable area of the display output of a digital information
device, an indicium of each of which being accessible by a
user;
means for selecting any of said indicia in response to a
user input and moving it to user specified coordinates within
said viewable area;
means for defining the size and location of subset of the
viewable area within said area based upon said coordinates.

19. A method for presenting information in conjunction
with a device comprising the following steps:

defining a plurality of windows within the display output
of the device, an indicium of each of which being accessible by
a user;

selecting any of said indicia in response to a user input
and moving it to user specified coordinates within said display
output; and

defining the subset of the display output based upon said
coordinates.
FIG. 1
PRIOR ART

<table>
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<tr>
<th>ALPHA</th>
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<table>
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<tbody>
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FIG. 2
PRIOR ART

SUBSTITUTE SHEET (RULE 26)
FIG. 9

USER CLICKS ON TAB, DRAG AND RELEASES

HAS CURSOR BEEN RELEASED OUTSIDE OF THE TITLE BAR 101?

NO → TOP WINDOW CORRESPONDING TO TAB.

YES → READ X AND Y COORDINATES OF CURSOR RELEASE POINT

WITHIN AREA A (CLOSER TO THE LEFT PERIMETER THAN TOP)?

NO → EXPAND WINDOW CORRESPONDING TO SELECTED TAB WITH WIDTH DETERMINED BY X AND TALL ENOUGH TO ABUT THE EDGES OF THE METAVIEW OR WINDOWS WITHIN THE METAVIEW ON EITHER SIDE OF THE RELEASE POINT.

YES → WITHIN AREA B (CLOSER TO THE TOP PERIMETER THAN LEFT)?

NO → EXPAND WINDOW CORRESPONDING TO SELECTED TAB WITH WIDTH DETERMINED BY X AND TALL ENOUGH TO ABUT THE EDGES OF THE METAVIEW OR WINDOWS WITHIN THE METAVIEW ON EITHER SIDE OF THE RELEASE POINT.

YES → EXPAND WINDOW CORRESPONDING TO SELECTED TAB WITH HEIGHT DETERMINED BY Y AND WIDE ENOUGH TO ABUT THE EDGES OF THE METAVIEW OR WINDOWS WITHIN THE METAVIEW ON EITHER SIDE OF THE RELEASE POINT.
FIG. 16

FIG. 17

SUBSTITUTE SHEET (RULE 26)
### A. CLASSIFICATION OF SUBJECT MATTER

**IPC 6 G06F3/033**

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 6 G06F**

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)

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>X</td>
<td>EP 0 689 133 A (ADOBE SYSTEMS INC) 27 December 1995</td>
<td>1, 3-7, 9, 11-15, 17-19</td>
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<tr>
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<td>EP 0 499 129 A (SONY CORP) 19 August 1992</td>
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**X** Further documents are listed in the continuation of box C.

**X** Patent family members are listed in 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 document but published on or after the international filing date
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- **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
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- **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  **18 December 1998**

Date of mailing of the international search report  **29/12/1998**

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Authorized officer  
Bravo, P
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<td>A</td>
<td>&quot;WINDOW PULL-OUT&quot; IBM TECHNICAL DISCLOSURE BULLETIN, vol. 38, no. 8, 1 August 1995, page 245 XP000534502 see the whole document</td>
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<td>A</td>
<td>EP 0 156 116 A (IBM) 2 October 1985 see abstract see page 4, line 1 - page 6, line 16; figures 1,2</td>
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<td>P,X</td>
<td>EP 0 841 609 A (ADOBE SYSTEMS INC) 13 May 1998 see abstract see column 2, line 3 - line 7; figure 17 see column 3, line 50 - column 4, line 9 see column 5, line 10 - column 8, line 12; figures 1A-6</td>
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