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(54) SEARCH WINDOW FOR ADDING PROGRAM ELEMENTS TO A PROGRAM

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Publication Classification

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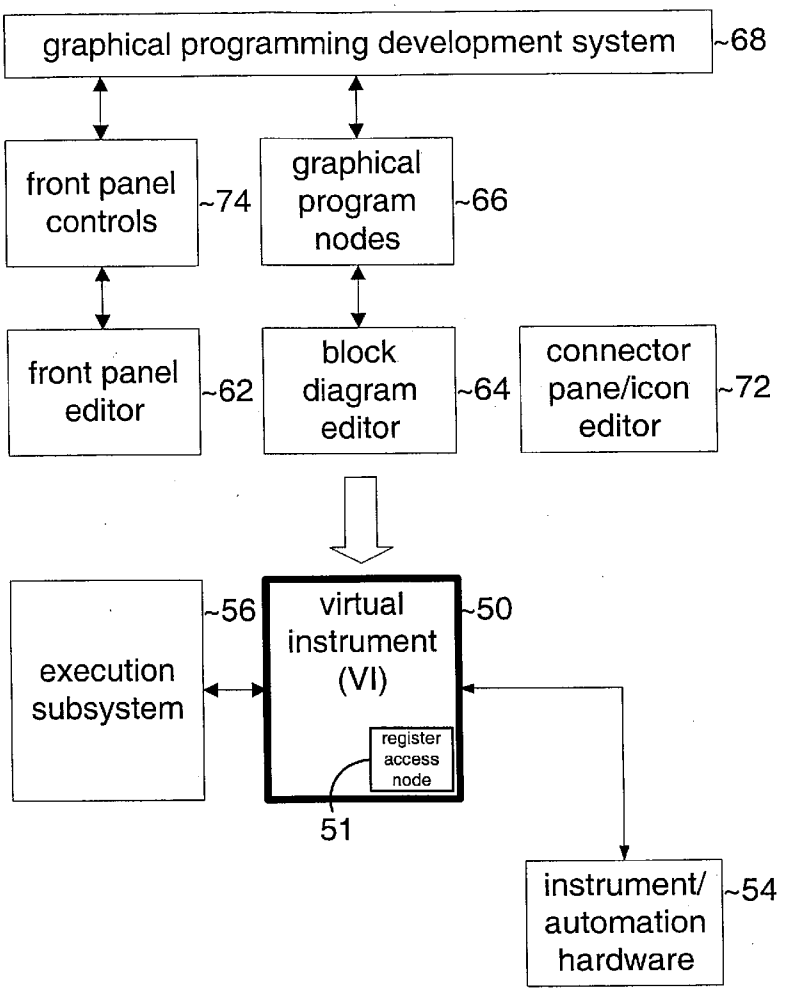
G06F 9/44 (2006.01)

(52) **U.S. Cl.** **717/109**

(57) **ABSTRACT**

A system and method for searching for items in a hierarchy of palette windows and for incorporating located items into programs. Palette windows may include one or more palette window selection items that, when selected, open child palette windows of the current palette window. Palette windows may include one or more items for navigating in the hierarchy. A search mechanism for locating palette windows and/or palette window content may be provided. From the search mechanism, the user may locate and open palette windows in one or more hierarchies. The user may also incorporate palette window content into something, for example, a program being edited in a graphical programming environment. In one embodiment, the user may drag-and-drop palette window content onto a window being edited.



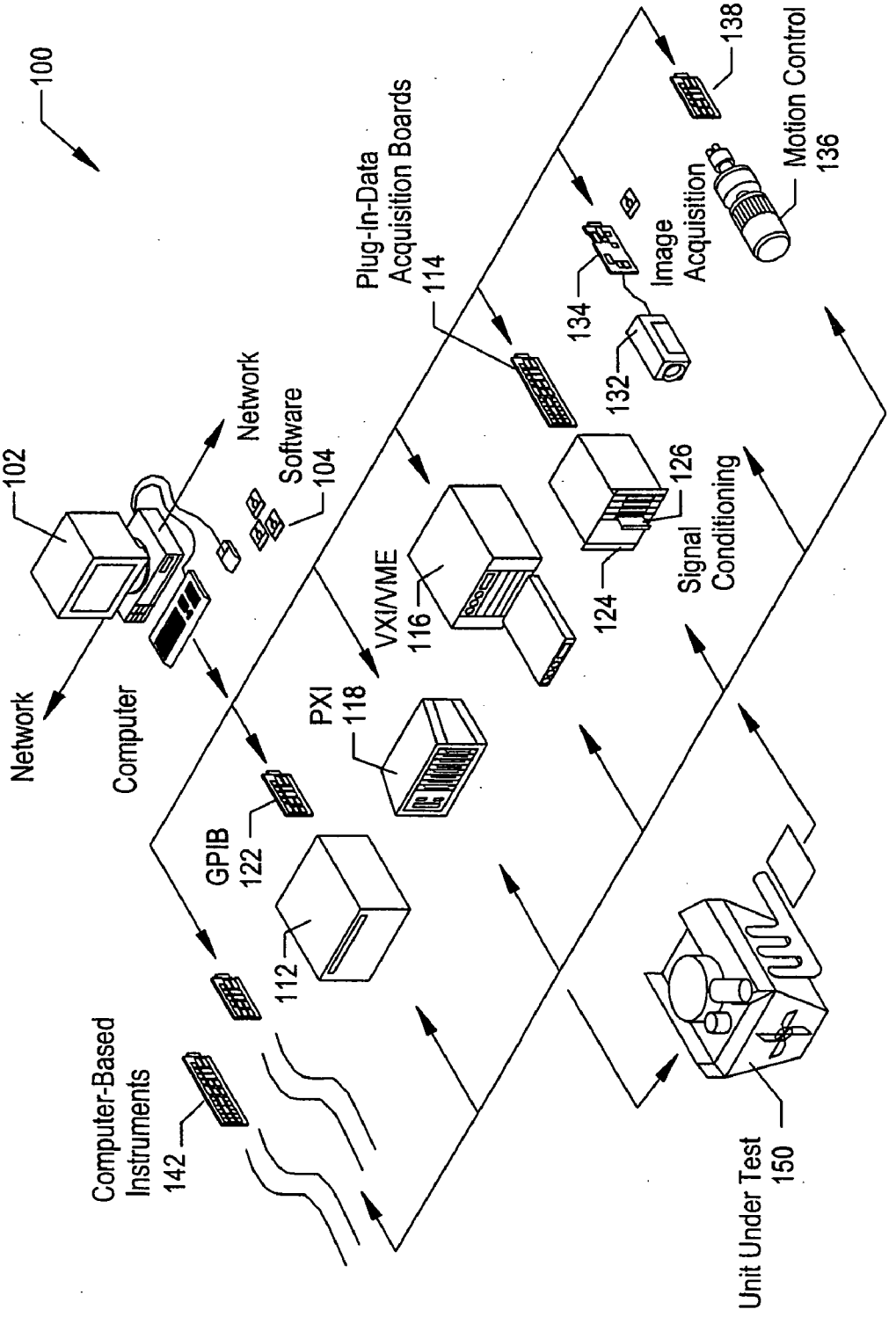

100
102
Network
Computer
Network
Software
104
Plug-In-Data
Acquisition Boards
114
VXI/VME
116
PXI
118
GPIB
122
112
Computer-Based
Instruments
142
124
126
Signal
Conditioning
132
134
Image
Acquisition
138
Motion Control
136
Unit Under Test
150

FIG. 1A

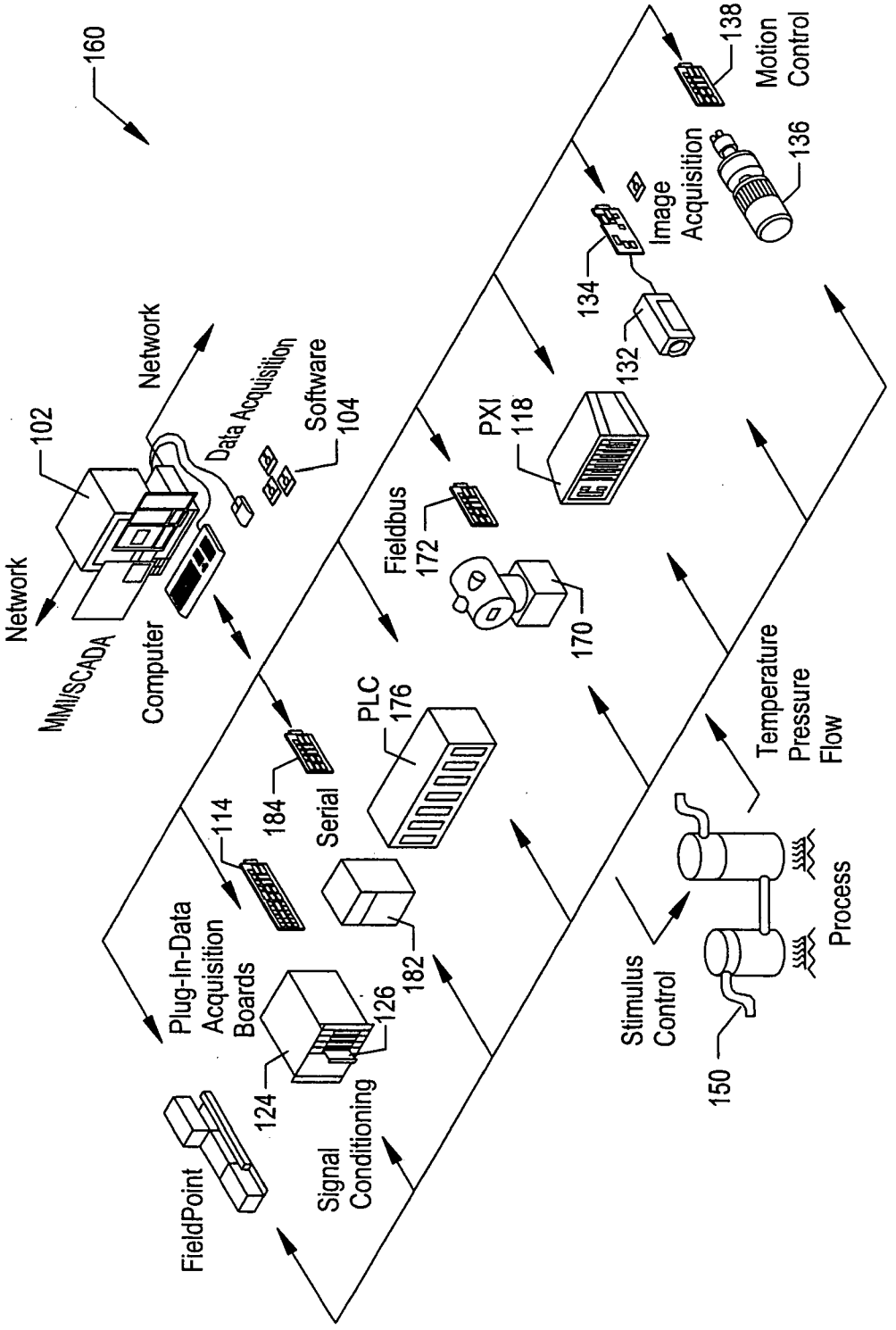

160
Network
102
Network
Data Acquisition
Software
104
MMI/SCADA
Computer
PXI
118
132
134
Image
Acquisition
136
138
Motion
Control
Fieldbus
172
170
PLC
176
184
Serial
114
Plug-In-Data
Acquisition
Boards
126
182
124
FieldPoint
Signal
Conditioning
Stimulus
Control
150
Temperature
Pressure
Flow
Process

FIG. 1B

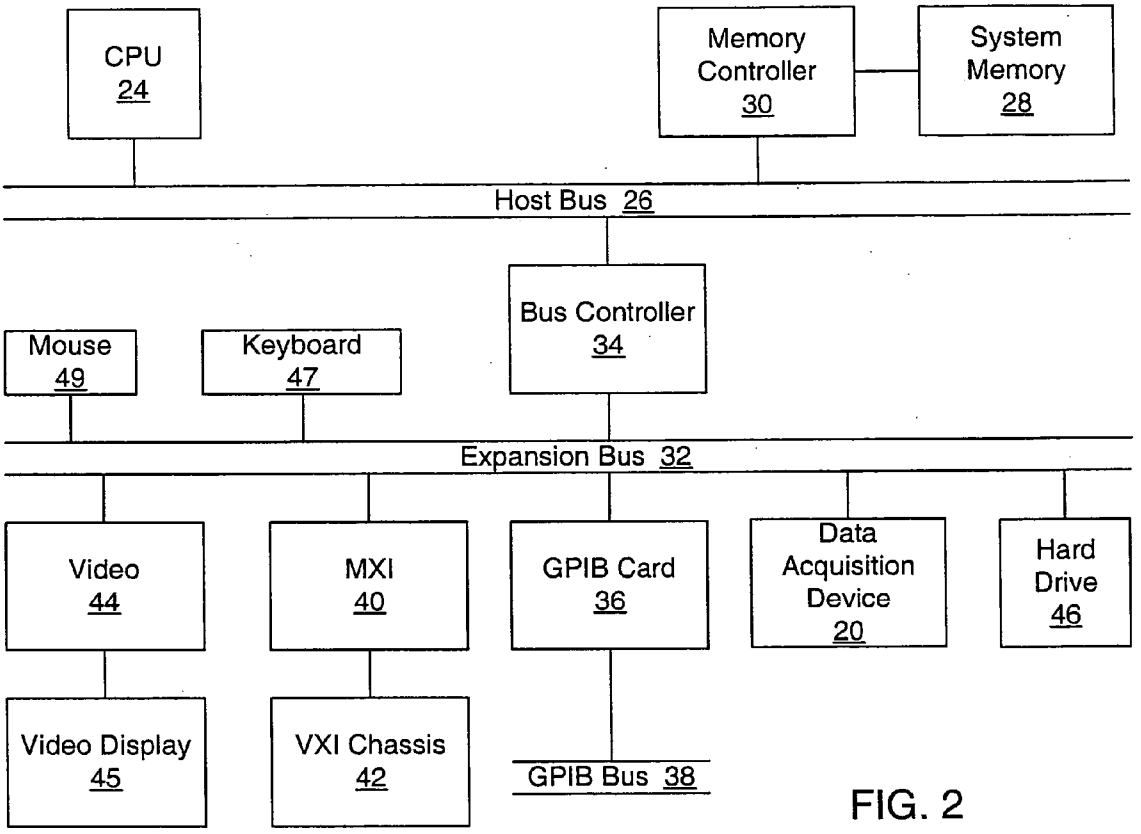

CPU
24
Memory
Controller
30
System
Memory
28
Host Bus 26
Bus Controller
34
Mouse
49
Keyboard
47
Expansion Bus 32
Video
44
MXI
40
GPIB Card
36
Data
Acquisition
Device
20
Hard
Drive
46
Video Display
45
VXI Chassis
42
GPIB Bus 38

FIG. 2

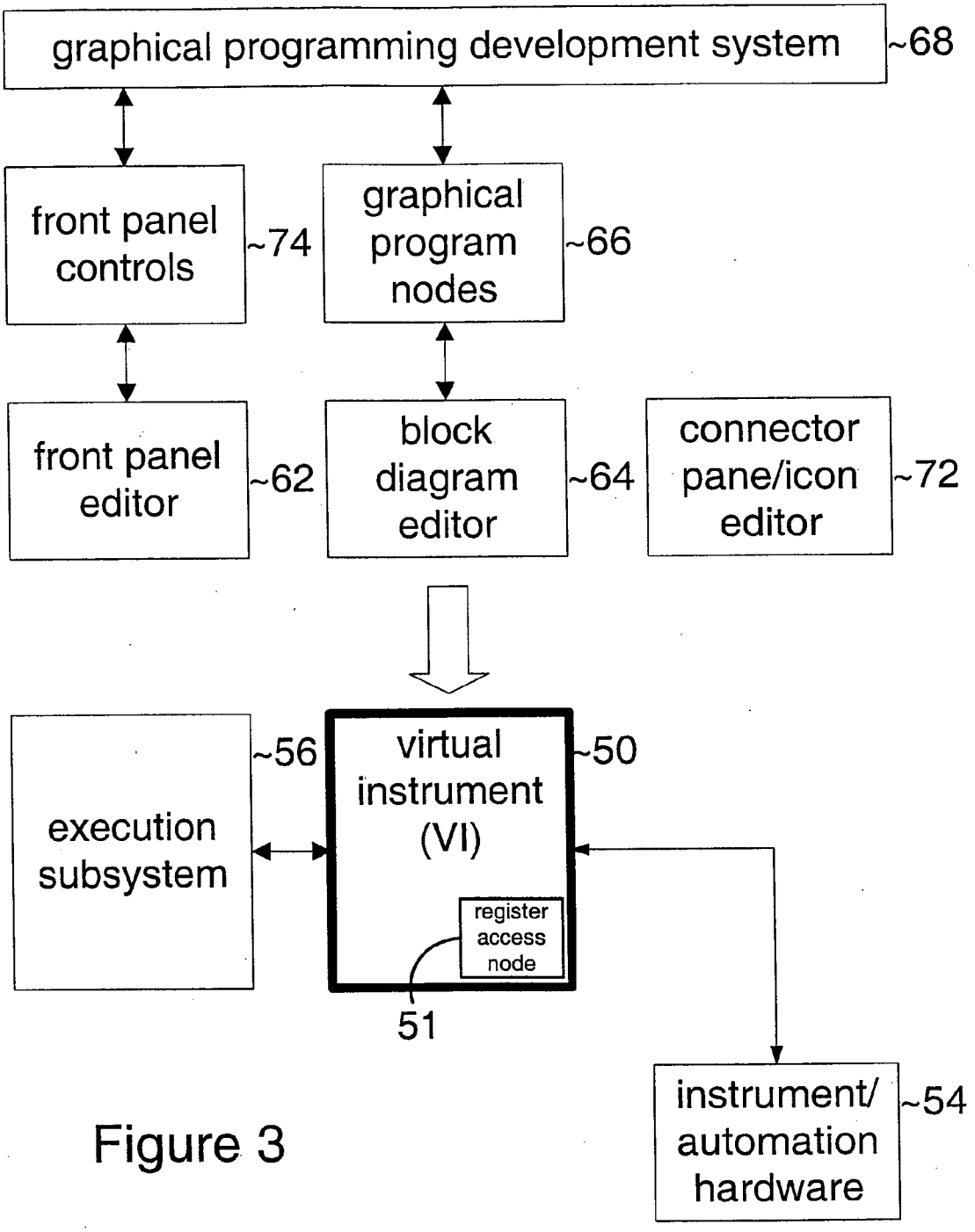

graphical programming development system
~68
front panel controls
~74
graphical program nodes
~66
front panel editor
~62
block diagram editor
~64
connector pane/icon editor
~72
execution subsystem
~56
virtual instrument (VI)
~50
register access node
51
instrument/ automation hardware
~54

Figure 3

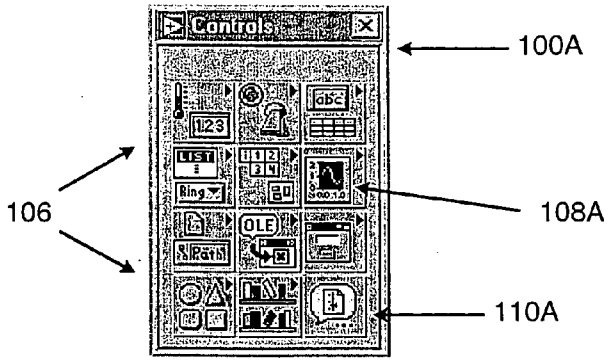


FIG. 4A
Prior Art

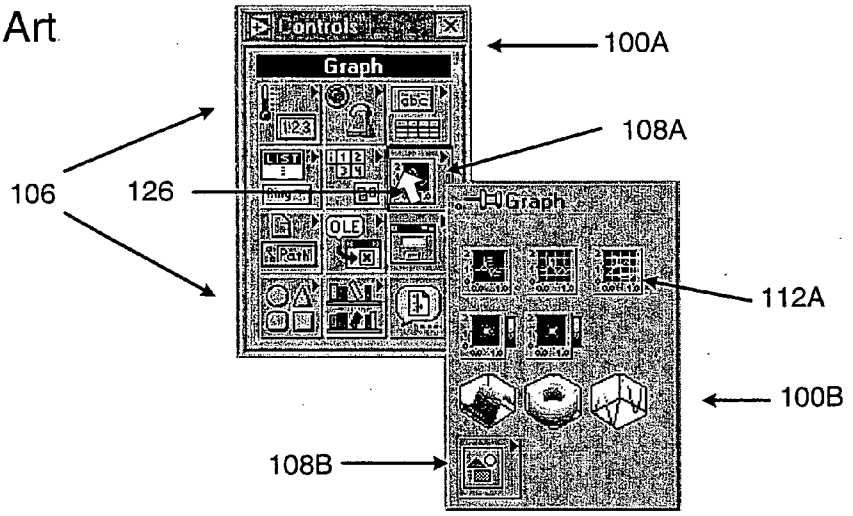


FIG. 4B
Prior Art

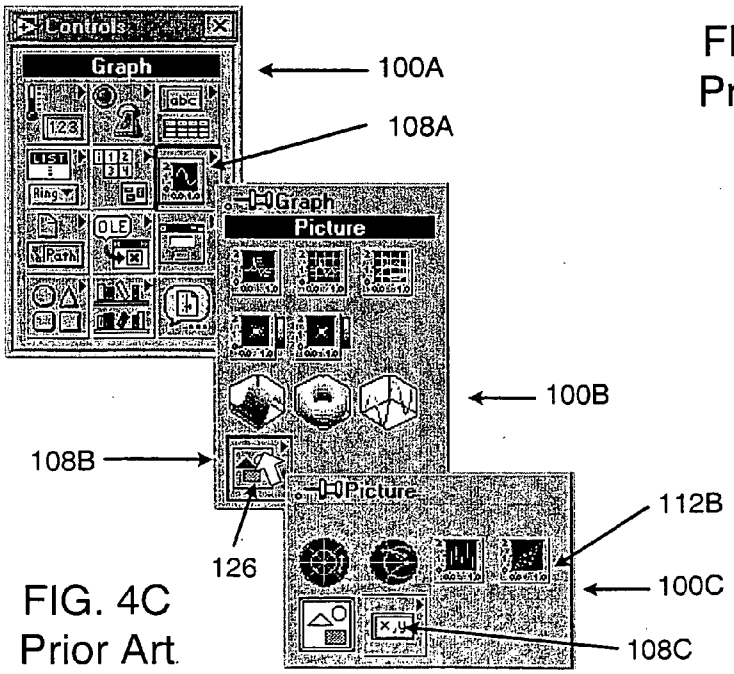


FIG. 4C
Prior Art

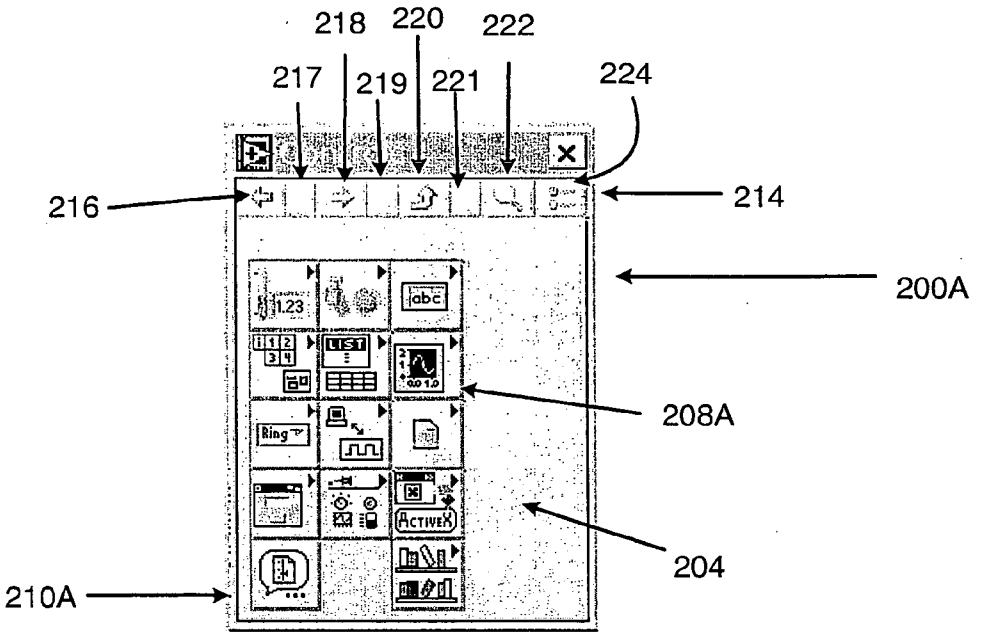

218
220
222
217
219
221
224
216
214
200A
208A
204
210A

FIG. 5A

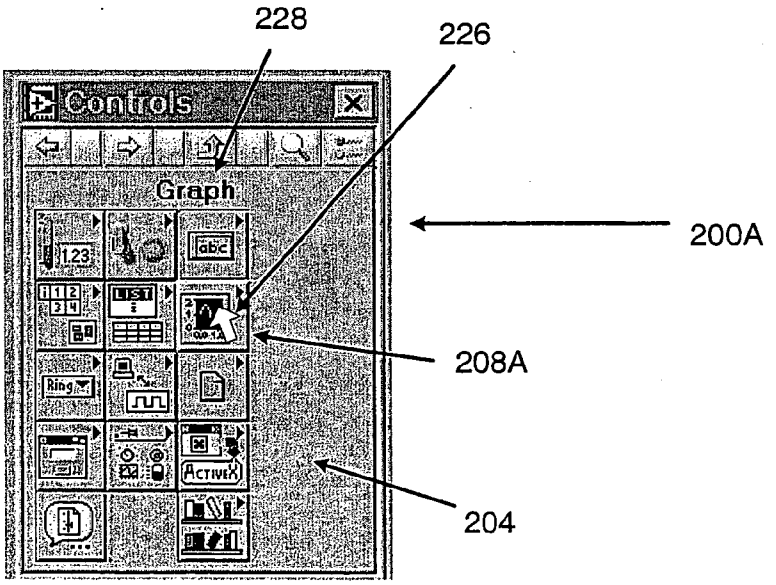

228
226
Controls
Graph
200A
208A
204

FIG. 5B

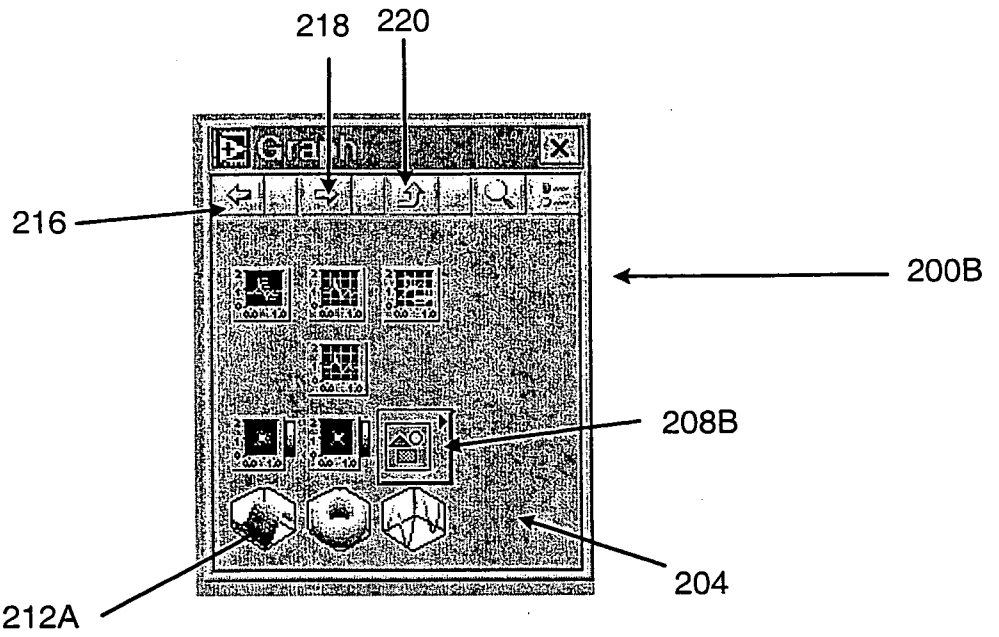

218
220
216
200B
208B
204
212A

FIG. 5C

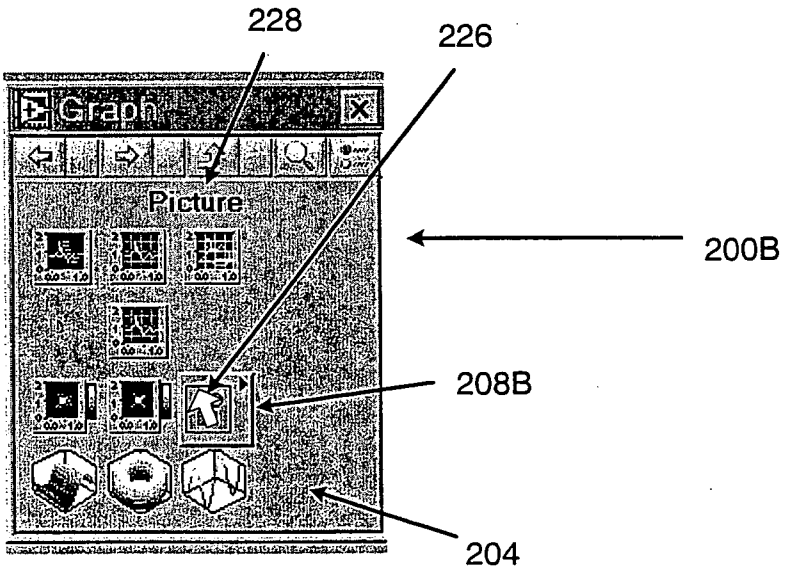

228
226
Graph
Picture
200B
208B
204

FIG. 5D

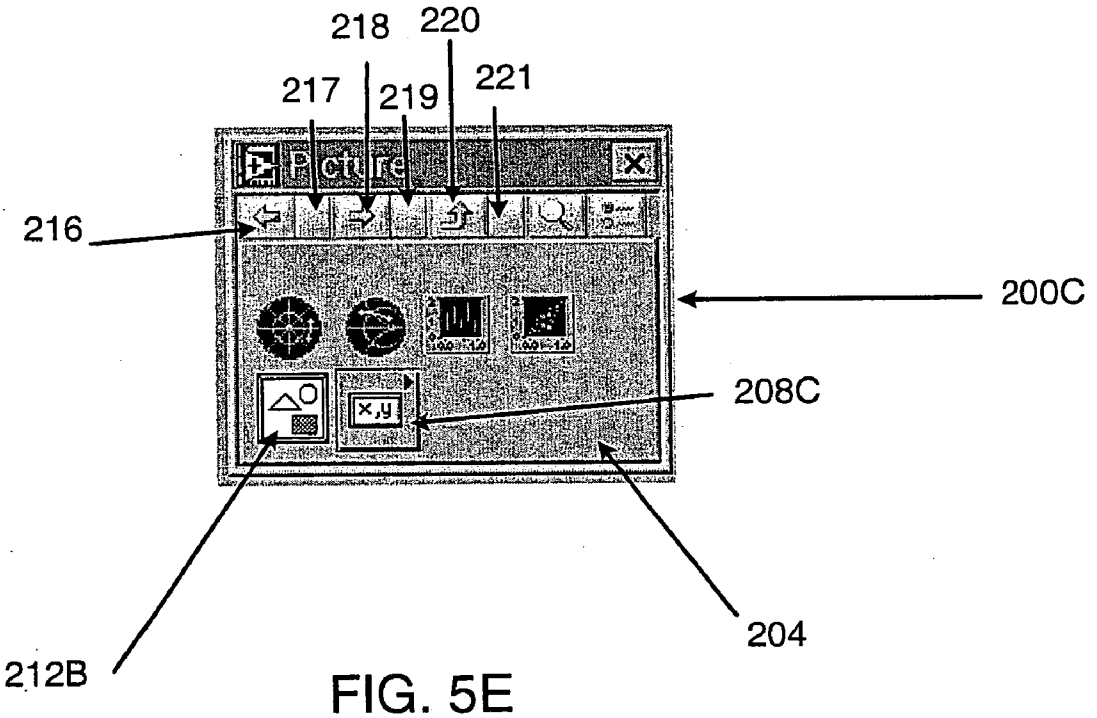


FIG. 5E

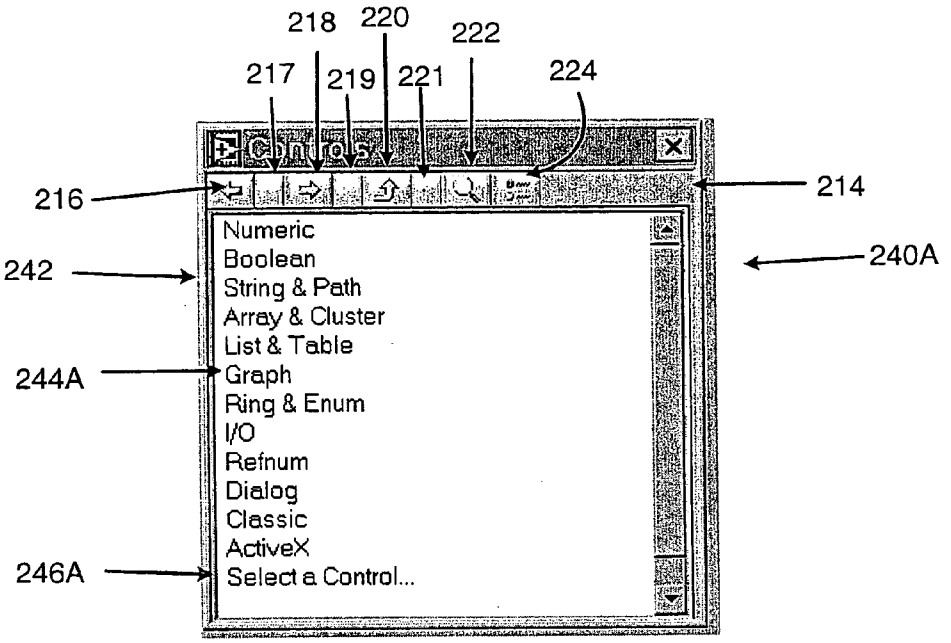

218
220
222
217
219
221
224
Controls
216
214
Numeric
Boolean
String & Path
Array & Cluster
List & Table
Graph
Ring & Enum
I/O
Refnum
Dialog
Classic
ActiveX
Select a Control...
242
240A
244A
246A

FIG. 6A

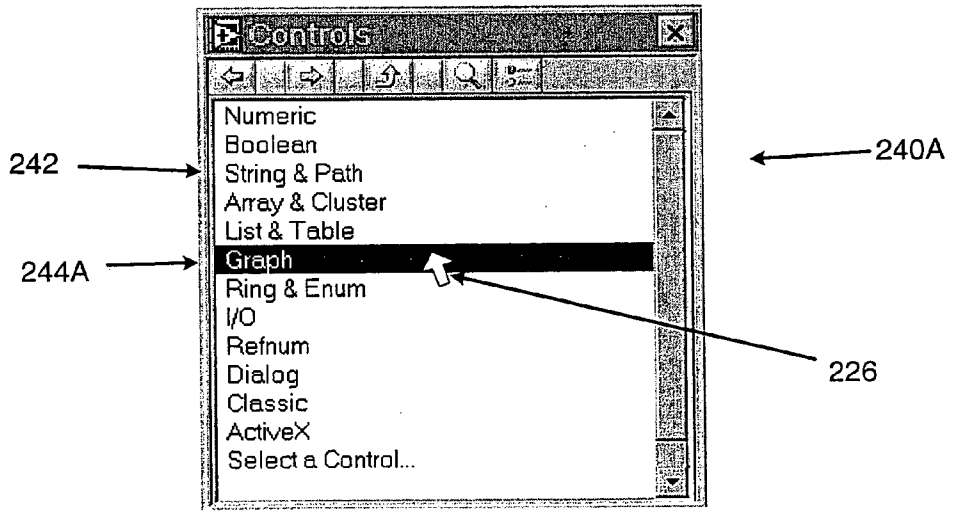

Controls
Numeric
Boolean
String & Path
Array & Cluster
List & Table
Graph
Ring & Enum
I/O
Refnum
Dialog
Classic
ActiveX
Select a Control...
242
240A
244A
226

FIG. 6B

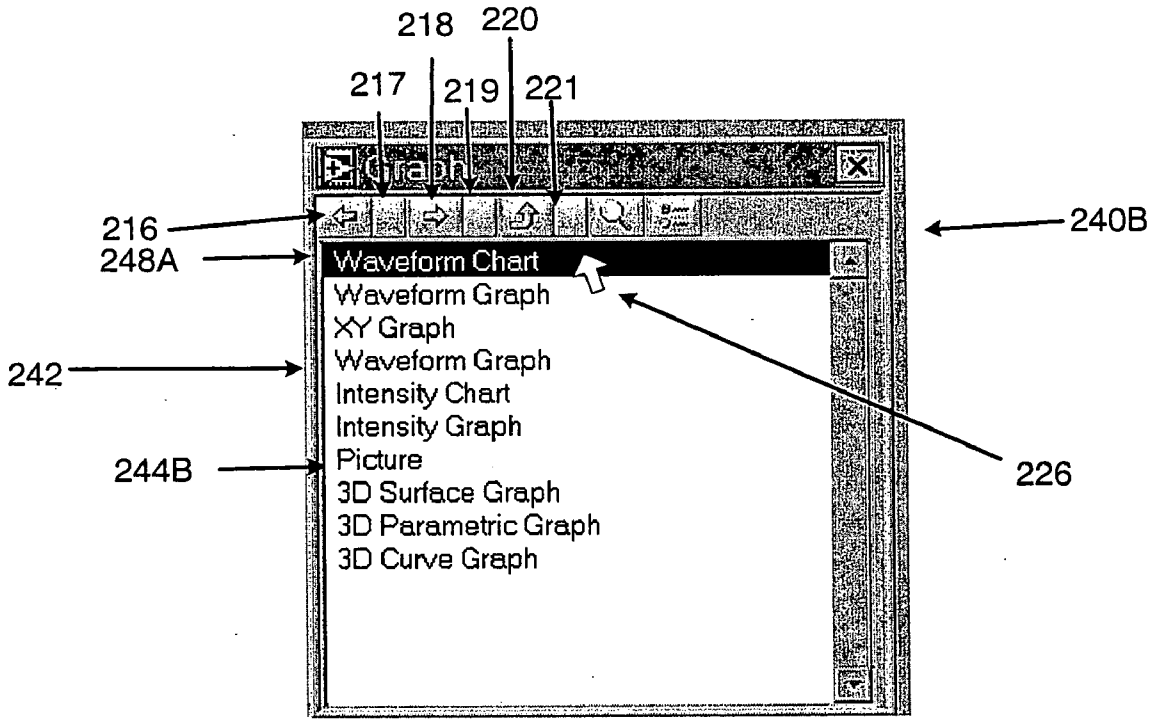

218
220
217
219
221
Graph
216
248A
240B
Waveform Chart
Waveform Graph
XY Graph
Waveform Graph
Intensity Chart
Intensity Graph
Picture
3D Surface Graph
3D Parametric Graph
3D Curve Graph
242
244B
226

FIG. 6C

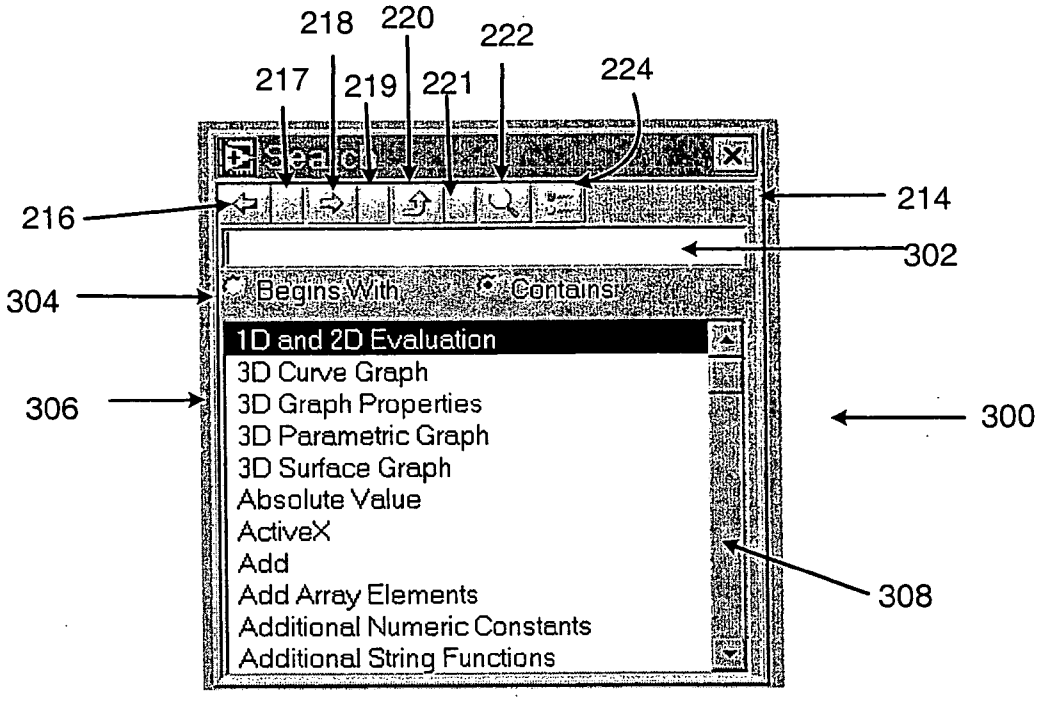

218
220
222
217
219
221
224
216
214
302
304
Begins With
Contains
306
300
1D and 2D Evaluation
3D Curve Graph
3D Graph Properties
3D Parametric Graph
3D Surface Graph
Absolute Value
ActiveX
Add
Add Array Elements
Additional Numeric Constants
Additional String Functions
308

FIG. 7A

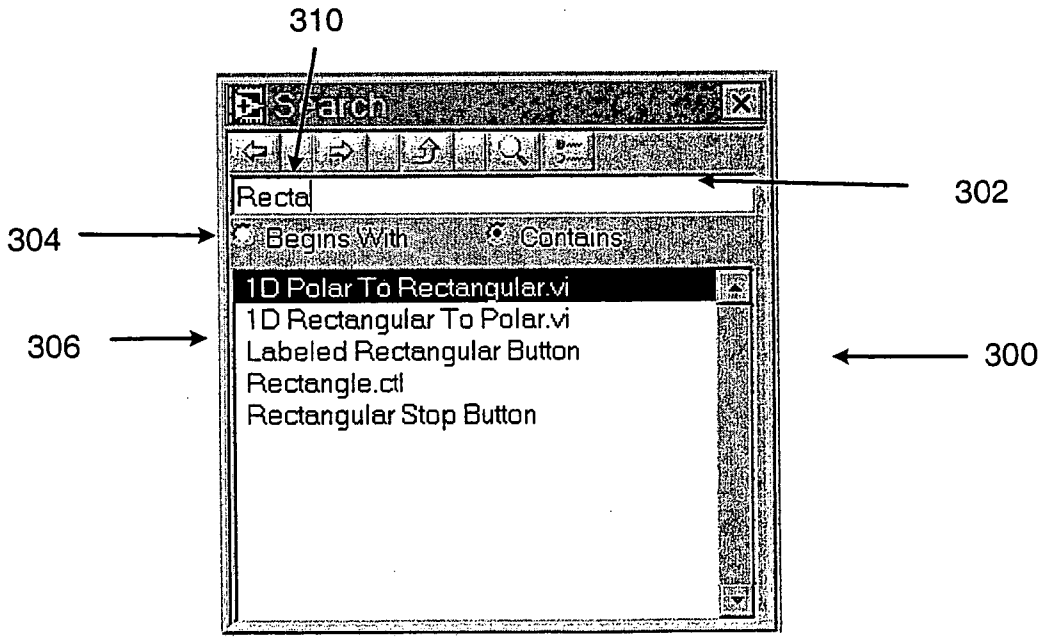

310
Search
Recta
302
304
Begins With
Contains
306
300
1D Polar To Rectangular.vi
1D Rectangular To Polar.vi
Labeled Rectangular Button
Rectangle.ctl
Rectangular Stop Button

FIG. 7B

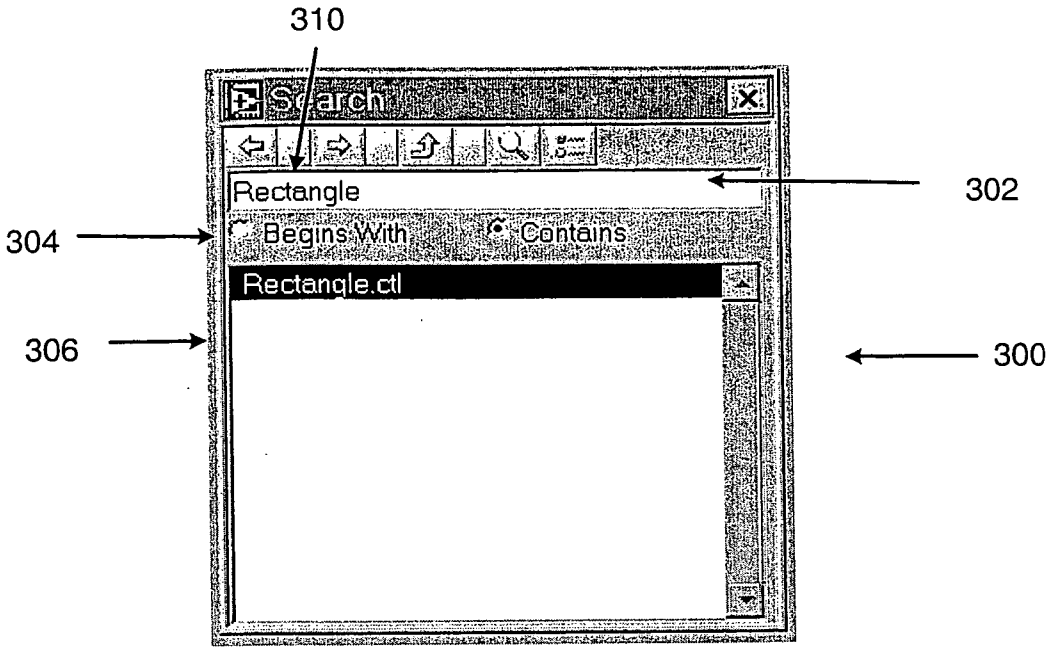

310
Search
Rectangle
302
304
Begins With
Contains
Rectangle.ctl
306
300

FIG. 7C

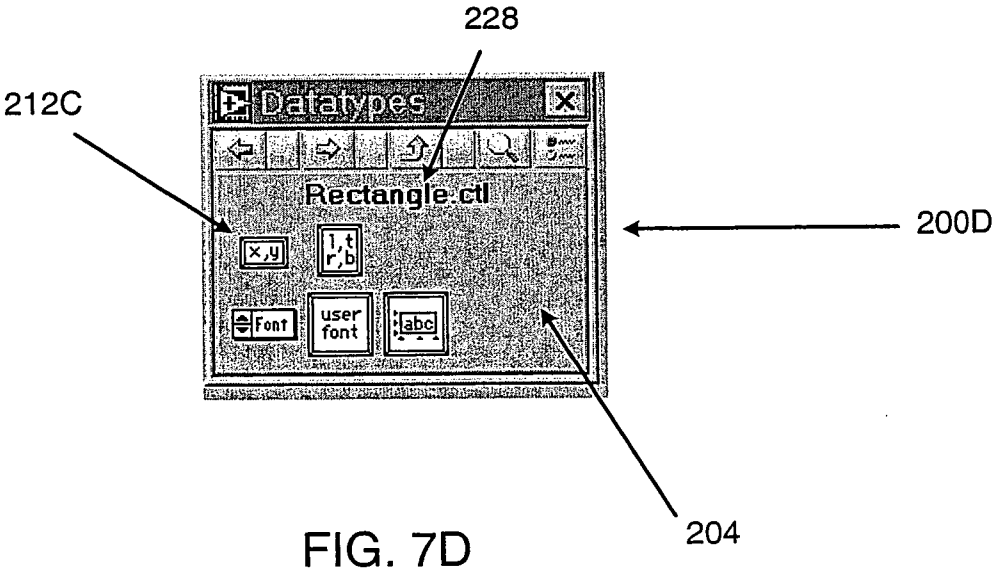

228
212C
Datatypes
Rectangle.ctl
200D
x,y
l,t
r,b
Font
user font
abc
204

FIG. 7D

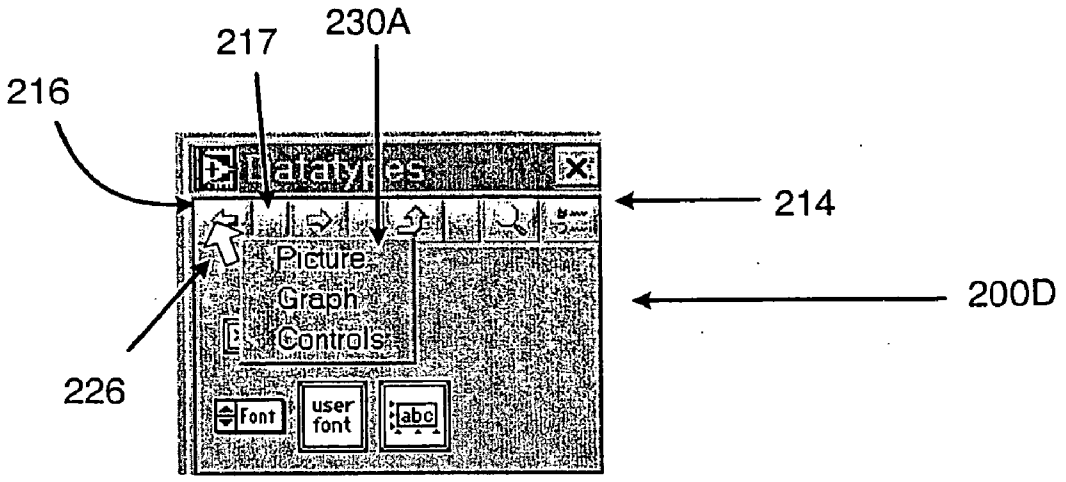

217
230A
216
214
200D
226
Picture
Graph
Controls
Font
user
font
abc

FIG. 8A

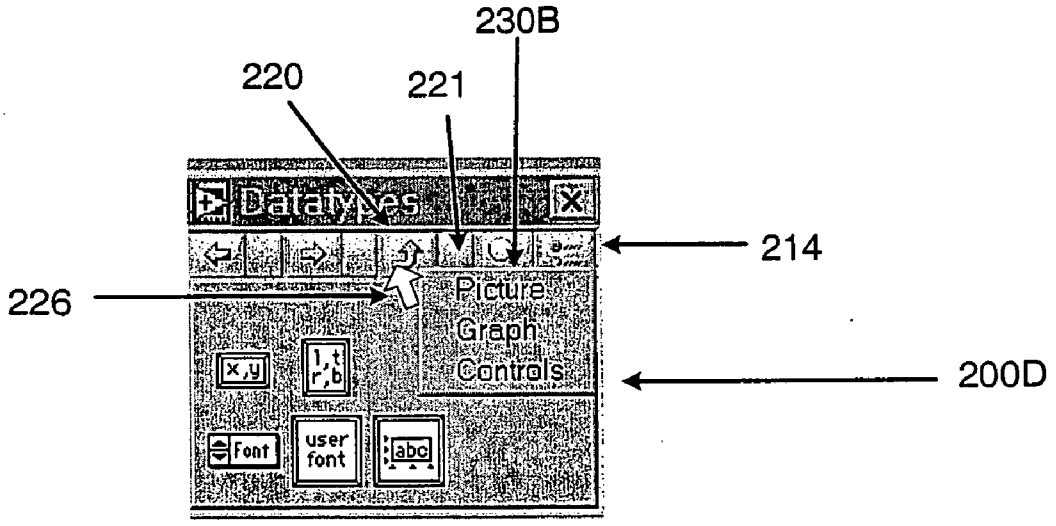

230B
220
221
214
226
200D
Picture
Graph
Controls
x,y
Font
user
font
abc

FIG. 8B

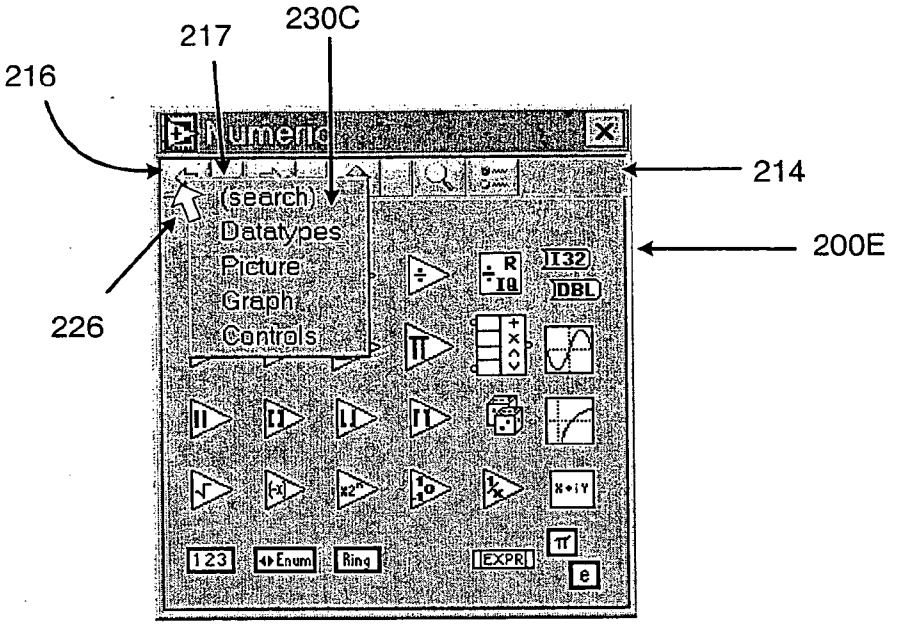

217
230C
216
214
200E
226
(search)
Datatypes
Picture
Graph
Controls
I32
DBL
123
Enum
Ring
EXPR

FIG. 9A

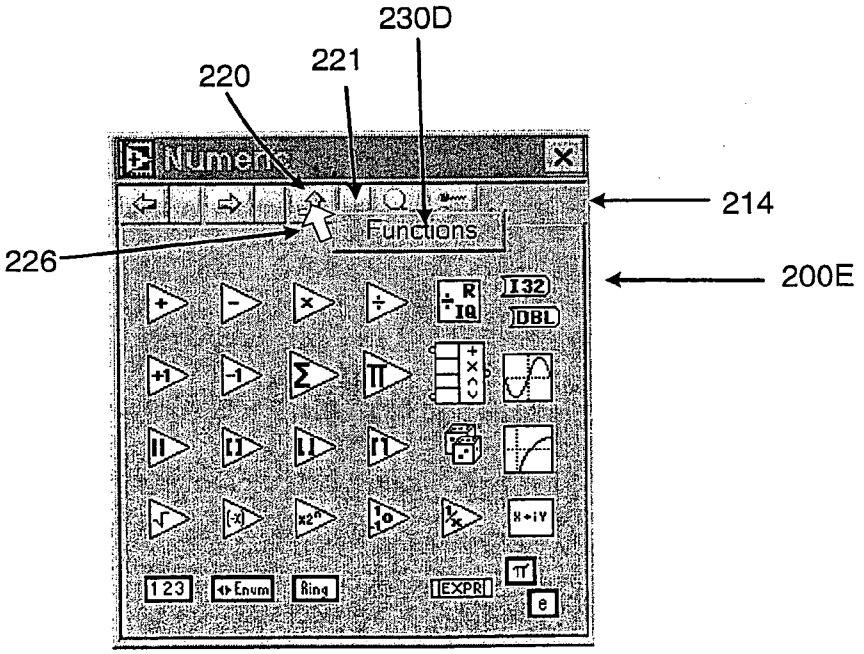

230D
220
221
214
226
200E
Functions
I32
DBL
123
Enum
Ring
EXPR

FIG. 9B

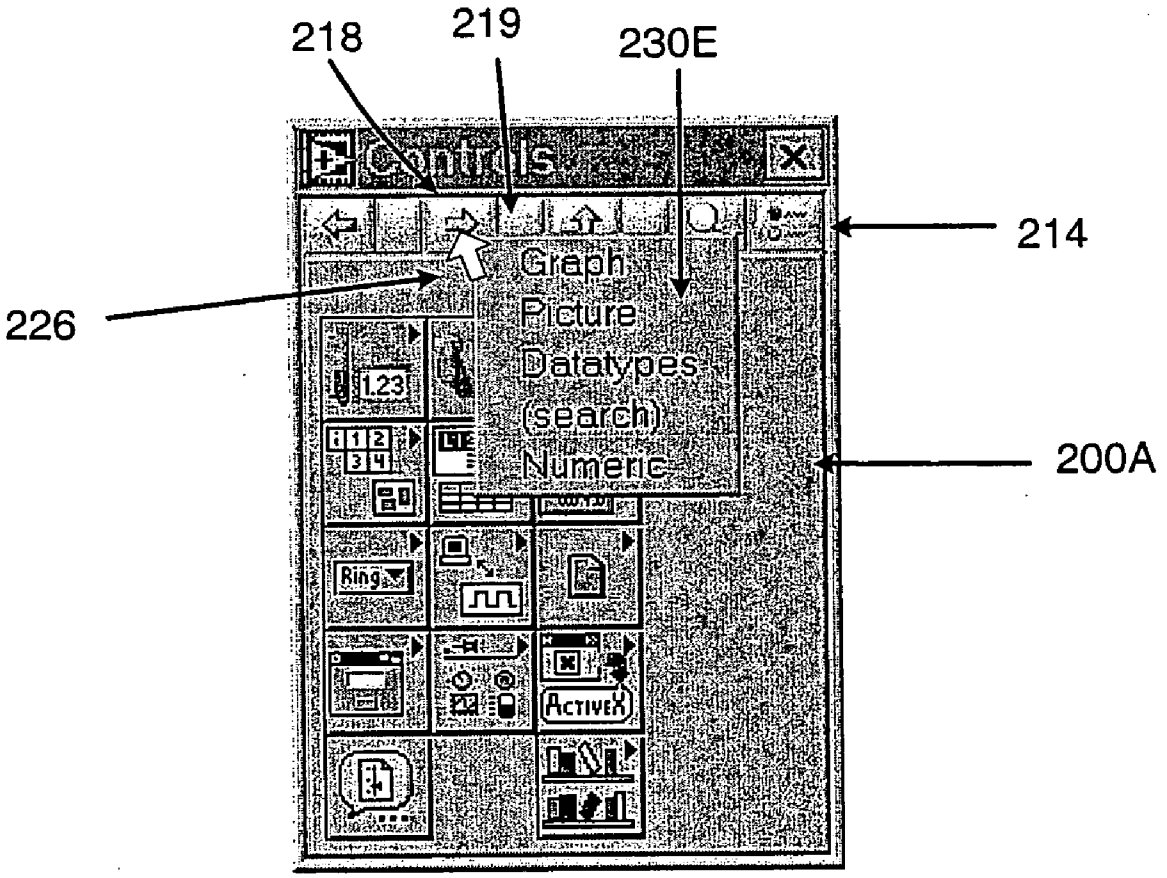

218
219
230E
214
226
200A
Controls
Graph
Picture
Datatypes
(search)
Numeric
Ring
ActiveX

FIG. 9C

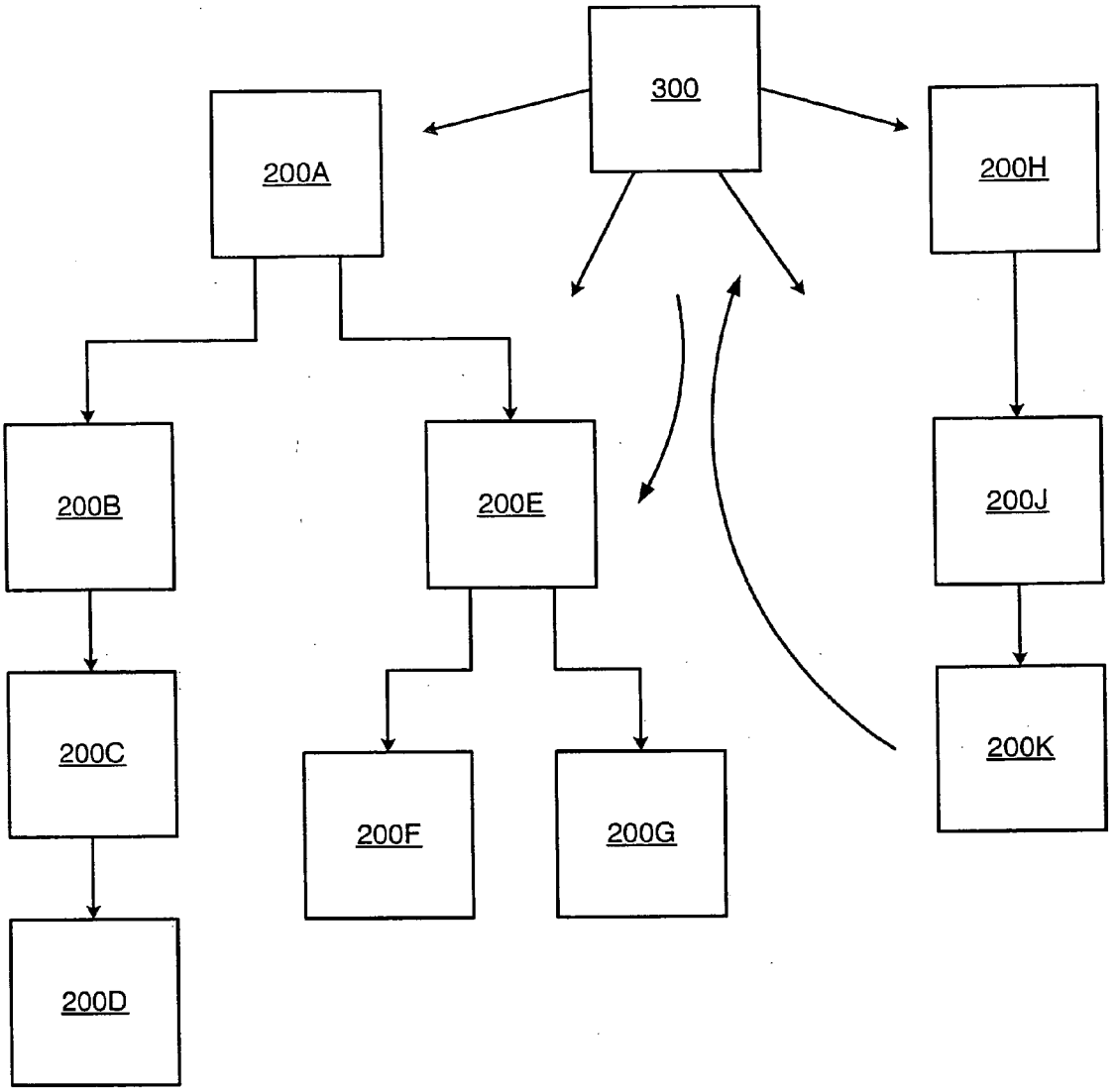


FIG. 10

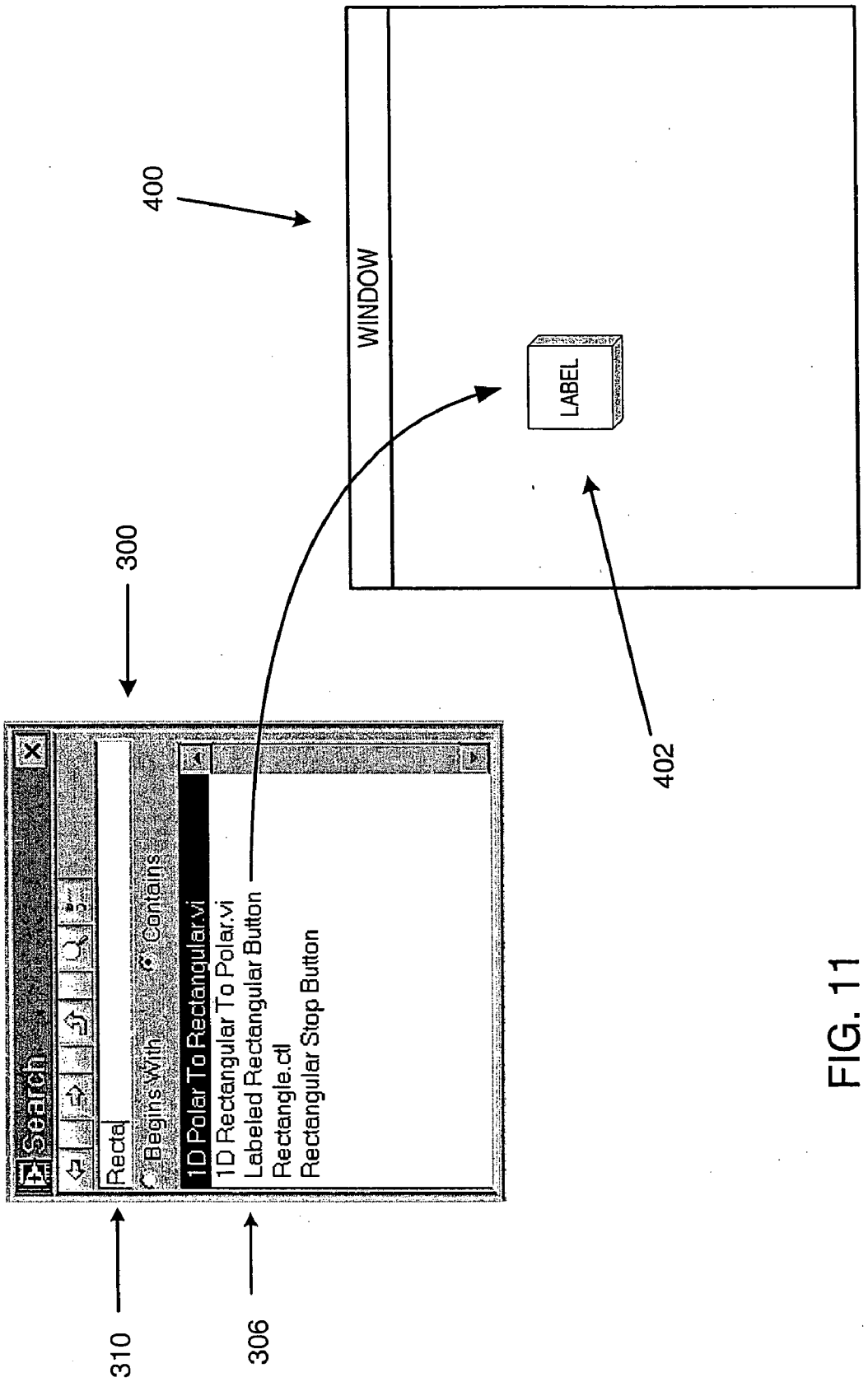

400
WINDOW
LABEL
402
300
Search
Recta
Begins With
Contains
1D Polar To Rectangular.vi
1D Rectangular To Polar.vi
Labeled Rectangular Button
Rectangle.ctl
Rectangular Stop Button
310
306

FIG. 11

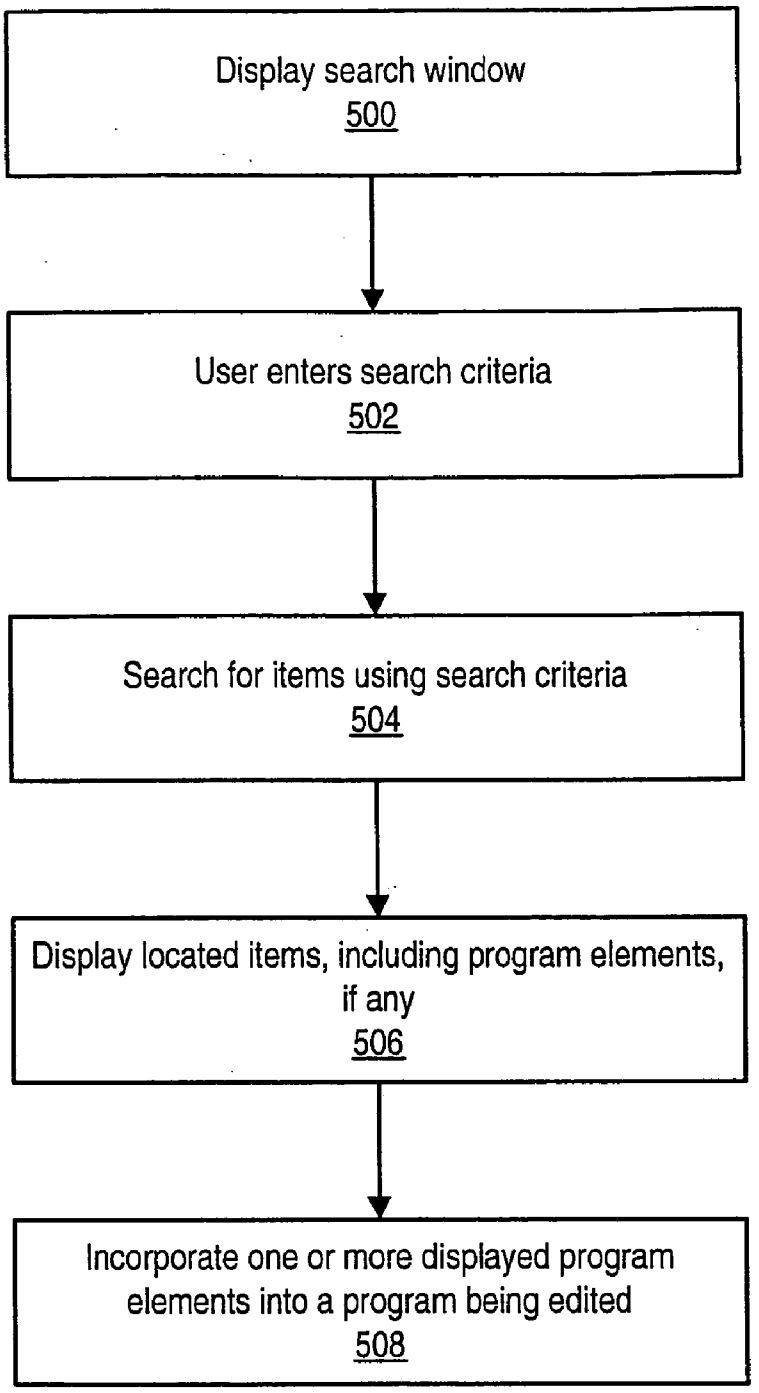

Display search window
500
User enters search criteria
502
Search for items using search criteria
504
Display located items, including program elements, if any
506
Incorporate one or more displayed program elements into a program being edited
508

FIG. 12

SEARCH WINDOW FOR ADDING PROGRAM ELEMENTS TO A PROGRAM

CONTINUATION DATA

[0001] This application is a Continuation of co-pending application Ser. No. 09/894,660 titled "Graphical User Interface Including Palette Windows with an Improved Search Function" and filed on Jun. 28, 2001, which is a Continuation-In-Part of U.S. patent application Ser. No. 09/752,654 titled "Graphical User Interface Including Palette Windows with an Improved Navigation Interface" filed Dec. 27, 2000, whose inventors were Justin Chickles and Raghavendra Gururaj.

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FIELD OF THE INVENTION

[0003] The present invention relates to the field of computer user interface design, and in particular to an improved user interface for searching for items in a hierarchy of palette windows and for incorporating located items into programs.

DESCRIPTION OF THE RELATED ART

[0004] A primary goal of a graphical user interface (GUI) is to provide the user the maximum amount of intuitiveness, familiarity and flexibility in navigating among the components of the GUI. Some GUIs include one or more palette windows which each contain a plurality of items that may be selected. For example, a user may select one or more items in a palette window for use in a user interface being created, for inclusion in a computer program being created, or for other purposes. Some GUIs also include a hierarchy of palette windows, wherein a palette window may include a palette window selection item that, when selected, displays a lower palette window ("child palette window") in the hierarchy. A user may select a palette window selection item in a palette window to view a palette window lower in the hierarchy.

[0005] As one example, National Instruments' LabVIEW graphical programming system includes a hierarchy of palette windows for enabling a user to select front panel controls and indicators for inclusion in a front panel or user interface being created. Similarly, the LabVIEW system also includes a hierarchy of palette windows for enabling a user to select nodes for inclusion in a graphical program block diagram being created.

[0006] Prior art methods of accessing a hierarchy of palette windows for use in selecting or adding items have generally relied on window technology that displays multi-tiered, hierarchical windows, i.e., top level, level 1, level 2, level 3 windows, sub-windows, etc. Typically, when a lower-level window is selected from a higher-level window, at least a portion of the higher-level window remains displayed on the display screen. This method may be cumbersome for displaying windows for adding content items several levels deep in the hierarchy. In addition, there has been no mechanism provided for enabling a user to browse a hierarchy of palette windows in a browser-based fashion.

[0007] **FIGS. 4A-4C** illustrate a prior art method for accessing a hierarchy of palette windows. **FIGS. 4A-4C** illustrate a prior art example of a hierarchy of palette windows from the LabVIEW graphical programming environment. Program elements, including user interface elements such as controls and indicators (e.g. ActiveX controls, buttons, switches, graphs, gauges, etc.), may be added to a software application under development by using the exemplary palette windows **100** as illustrated in **FIG. 4A-4C**. Palette windows **100** as illustrated in **FIG. 4A** may include one or more items which may include palette window selection items **108** (for example, graph palette window selection item **108**A of **FIG. 4A**), and palette items. Exemplary palette items include program elements **112** (for example, user interface element **112**A of **FIG. 4B**), or utility items **110** (for example, utility item **110**A of **FIG. 4A**). Each item may include a graphical or textual indication of the type of item it is, and may include graphical and/or textual indications of the palette window, program element, etc. that it represents.

[0008] Upon selecting palette window selection item **108**A of palette window **100**A, for example, by clicking or double-clicking the item, a second palette window **100**B is displayed as illustrated in **FIG. 4B**. In this example, palette window **100**A may be described as a parent of palette window **100**B, and palette window **100**B as a child of palette window **100**A. Palette window **100**B may partially cover or overlap palette window **100**A, which remains displayed. In this example, items in palette window **100**B may be related to adding graph functionality to a program currently being created or modified.

[0009] Upon selecting palette window selection item **108**B of palette window **100**B, a third palette window **100**C is displayed as illustrated in **FIG. 4C**. In this example, palette window **100**B may be described as a parent of palette window **100**C, and palette window **100**C as a child of palette window **100**B. In this example, items in palette window **100**C may be related to adding picture graphs to a program currently being created or modified. In this example, user interface element **112**B may be added to a user interface window in a program currently being created or modified, for example, by dragging and dropping the item on the user interface window. Palette window **100**C may also include one or more palette window selection items **108**, for example, item **108**C, that, when selected, may display further child palette windows **100** of palette window **100**C. Note that previously opened palette windows **100** in the hierarchy remain displayed when a child palette window of a current palette window is opened. Also, by selecting other palette window selection items **108** on one of the palette windows **100**, other branches of the hierarchy of palette windows may be displayed.

[0010] Prior art methods also do not provide for easily locating a particular item among a hierarchy of palette windows. For larger programs, the hierarchy of palette windows may include several hundred items. The prior art methods may be inadequate to allow the user to search through the items for a specific keyword or item name and to navigate to a palette window including a desired item. The

prior art methods also may be inadequate in allowing the user to incorporate located items directly into a program being edited in the graphical user interface. Therefore, it is desirable to provide an improved method or methods for searching for items in a hierarchy of palette windows in a graphical user interface and for allowing located items to be incorporated directly into programs.

SUMMARY OF THE INVENTION

[0011] One embodiment of the present invention provides a system and method for presenting a graphical user interface (GUI) having one or more hierarchies of palette windows, wherein the GUI includes an improved navigation interface for the palette windows. As used herein, a palette window may include the notion of a window (e.g. dialog window) displayed by a program which may include one or more items from which a user may select. A palette window may include palette items that may be selected by a user to add some functionality, capability or element to a program. A palette window may also include one or more palette window selection items for selecting child palette windows in the hierarchy. The palette windows in the hierarchy preferably include an improved navigation interface for navigating among windows in the hierarchy.

[0012] Embodiments of the present invention may be used in any of various types of programs or applications which use a hierarchy (or hierarchies) of palette windows. One example where the invention may be used is a hierarchy of palette windows that include user interface elements that may be selected for inclusion in a graphical user interface being created. Another example where the invention may be used is a hierarchy of palette windows that include nodes that may be selected for inclusion in a graphical program being created. Thus example applications that may use hierarchies of palette windows as disclosed herein include, but are not limited to, programs for creating a graphical user interface and programs for creating a graphical program.

[0013] In one embodiment, a palette window in the hierarchy of palette windows may be displayed or opened. In one embodiment the user may directly open a palette window through the application's user interface, such as by selecting a menu item. The palette window may also be automatically opened when the user performs another function, such as opening a window to create something that uses palette items contained in the hierarchy of palette windows. For example, in creation of a GUI, when the user opens a blank GUI window to begin creating the GUI, a parent palette window in the hierarchy of palette windows may be displayed. As another example, in creation of a block diagram of a graphical program, when the user opens a blank block diagram window to begin creating the block diagram, the parent palette window in the hierarchy of palette windows may be displayed.

[0014] Palette windows may include various items, including palette items and palette window selection items. Palette items may be selectable from a palette window to perform various program functions or may be selectable for inclusion in something being created. As noted above, palette window selection items may be selected to display child palette windows in the hierarchy. Some palette windows in a hierarchy may comprise only palette window selection items. Other palette windows (e.g. the lowest palette windows in the hierarchy) may comprise only palette items and not include any palette window selection items. Other windows may comprise a combination of palette window selection items and other types of items. For example, in one embodiment of a graphical programming application, palette windows may include palette window selection items and may also include palette items that comprise selectable program elements such as user interface elements and/or function nodes. The user interface elements or program elements may be selected and added to user interface or block diagram windows of a program being created or edited. Unlike the palette items, the palette window selection items are not added to user interface or block diagram windows when selected, but rather cause the display of lower level or child palette windows.

[0015] In one embodiment, palette windows in the hierarchy may include one or more navigation items for navigating among the hierarchy of palette windows. In one embodiment, the navigation items may be comprised in a navigation toolbar. In one embodiment, the navigation items may include one or more of a back navigation item, a forward navigation item, and an up navigation item. The navigation items may resemble "back" and "forward" arrows in a convention web browser. Thus the navigation items may present a browser type interface for navigating among the hierarchy of palette windows, similar to a web browser.

[0016] In one embodiment, a mechanism for searching for palette windows and/or palette window content (e.g. palette items such as program elements and palette window selection items) may be provided. In one embodiment, a search window may be opened from any of the palette windows in the hierarchy. The search window may provide an interface to allow the user to search for and locate palette windows and/or palette window content in the hierarchy. From the search window, the user may directly open located palette windows in the hierarchy. In embodiments including more than one hierarchy of palette windows, the search mechanism may allow a user to navigate from one hierarchy to another. For example, the user may open the search window from a first palette window in a first hierarchy, search for and locate a second palette window in a second hierarchy, and open the second palette window.

[0017] In one embodiment, palette items may be selectable from the search window to perform various program functions or may be selectable for inclusion in something being created, for example, a program in a graphical programming environment. A search window may be displayed on a computer display on which a program is being edited in the graphical user interface. A user may enter search criteria into the search window. The system may then search for and display located items indicated by the search criteria. These located items may include one or more items related to program elements that may be incorporated in a program being edited to add functionality to the program. The user may then select one or more located program elements and incorporate the one or more program elements in one or more windows of the program being edited. In one embodiment, a program element may be incorporated into the program by selecting the item and "dragging and dropping" the item on a window of the program. Other methods of incorporating items into programs may be used. Thus, the search results displayed in the search window may include

program elements that can be selected and incorporated directly from the search window into a window of the program being edited.

[0018] One embodiment of the invention may thus provide a hierarchy of palette windows that may be navigated in a manner similar to a web browser, wherein at most one palette window in a hierarchy is displayed at one time, and navigation items may provide a web browser type interface. The navigation interface described herein also provides improved navigation features over conventional web browsers, including improved search capabilities and improved browsing among and between hierarchies of panels.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] A better understanding of the present invention can be obtained when the following detailed description of various embodiments is considered in conjunction with the following drawings, in which:

[0020] **FIGS. 1A and 1B** illustrate exemplary instrumentation and industrial automation systems;

[0021] **FIG. 2** illustrates a computer system block diagram according to one embodiment;

[0022] **FIG. 3** is a block diagram illustrating the relationship of portions of the instrumentation and industrial automation systems according to one embodiment;

[0023] **FIGS. 4A-4C** illustrate a prior art method for navigating among palette windows;

[0024] **FIGS. 5A-5E** illustrate a method for navigating among a hierarchy of palette windows with graphical palette window selection items according to one embodiment;

[0025] **FIGS. 6A-6C** illustrate a method for navigating among a hierarchy of palette windows with textual palette window selection items according to one embodiment;

[0026] **FIGS. 7A-7D** illustrate a search window for locating palette windows in a hierarchy of palette windows according to one embodiment;

[0027] **FIGS. 8A and 8B** illustrate exemplary palette windows with several navigation items for navigating among a hierarchy of palette windows according to one embodiment;

[0028] **FIGS. 9A-9C** further illustrate exemplary palette windows with several navigation items for navigating among a hierarchy of palette windows according to one embodiment; and

[0029] **FIG. 10** illustrates a hierarchical organization of several palette windows according to one embodiment;

[0030] **FIG. 11** illustrates incorporating a located program element from a search window into a window of a program being edited according to one embodiment; and

[0031] **FIG. 12** is a flowchart of a method of searching for, locating and incorporating program elements according to one embodiment.

[0032] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that the drawings and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the present invention as defined by the appended claims. Note, the headings are for organizational purposes only and are not meant to be used to limit or interpret the description or claims.

DETAILED DESCRIPTION OF SEVERAL EMBODIMENTS

[0033] Embodiments of the present invention may be used in any of various types of programs or applications that use one or more hierarchies of palette windows to provide a user interface for selecting among various features or functions of the program or application. Embodiments of the invention may be used in an operating system, or in application programs. One exemplary application that may use a hierarchy (or hierarchies) of palette windows is an application for creating a graphical user interface (GUI). For example, the palette windows may include different user interface elements that may be selected for inclusion in the GUI being created. As another example, the hierarchy of palette windows may include different application programs or functions that may be selected. For example, an operating system may include one or more hierarchies of palette windows for selecting programs or functions within the operating system.

[0034] Another example application that may use a hierarchy (or hierarchies) of palette windows is a graphical programming development application. A graphical programming development application provides a graphical user interface (GUI) that enables users of the application to graphically create and/or edit graphical computer programs. A graphical program may include a block diagram and may optionally include a user interface. In this example, one hierarchy of palette windows may include nodes that may be selected for inclusion in the block diagram, and a second hierarchy of palette windows may include user interface elements that may be selected for inclusion in the user interface of the graphical program.

[0035] An example of a graphical programming environment is National Instruments' LabVIEW, which provides a graphical user interface that allows the user to create and/or edit graphical programs. LabVIEW includes functionality targeted toward creation of graphical programs, referred to as virtual instruments (VIs), for instrumentation and automation applications. The following describes an exemplary embodiment of the present invention used in a LabVIEW graphical programming development system. Thus the exemplary systems shown below are instrumentation and automation systems. Also, many of the screen shots used to illustrate the embodiments are representative of graphical programming environments similar to the LabVIEW graphical programming environment. It is noted, however, that embodiments of the present invention may be applied to any computer-executable program that uses one or more hierarchies of palette windows. Also, embodiments of the present invention may be used in any of various applications, and are not limited to instrumentation and automation applications.

FIGS. 1A and 1B—Instrumentation and Industrial Automation Systems

[0036] **FIGS. 1A and 1B** illustrate exemplary systems which may utilize software according to one embodiment of

the invention. **FIGS. 1A and 1B** illustrate systems targeted for instrumentation, industrial automation, or other purposes.

[**0037**] **FIG. 1A** illustrates an instrumentation control system **100**. The system **100** comprises a host computer **102**, which connects to one or more instruments. The host computer **102** may comprise a CPU, a display, memory, and one or more input devices such as a mouse or keyboard as shown. The computer **102** may connect through the one or more instruments to analyze, measure, or control a unit under test (UUT) or process **150**. The host computer **102** may store computer programs for creating or editing a graphical program, such as a graphical program, which interacts with or controls the one or more instruments.

[**0038**] The one or more instruments may include a GPIB instrument **112** and associated GPIB interface card **122**, a data acquisition board **114** and associated signal conditioning circuitry **124**, a VXI instrument **116**, a PXI instrument **118**, a video device **132** and associated image acquisition card **134**, a motion control device **136** and associated motion control interface card **138**, and/or one or more computer based instrument cards **142**, among other types of devices.

[**0039**] The instruments may be coupled to the unit under test (UUT) or process **150**, or may be coupled to receive field signals, typically generated by transducers. The system **100** may be used in a data acquisition and control application, in a test and measurement application, a process control application, or a man-machine interface application.

[**0040**] **FIG. 1B** illustrates an exemplary industrial automation system **160**. The industrial automation system **160** is similar to the instrumentation or test and measurement system **100** shown in **FIG. 1A**. Elements, which are similar or identical to elements in **FIG. 1A**, have the same reference numerals for convenience. The system **160** comprises a computer **102**, which connects to one or more devices or instruments. The computer **102** may comprise a CPU, a display screen, memory, and one or more input devices such as a mouse or keyboard as shown. The computer **102** may connect through the one or more devices to a process or device **150** to perform an automation function, such as MMI (Man Machine Interface), SCADA (Supervisory Control and Data Acquisition), portable or distributed data acquisition, process control, advanced analysis, or other control. In **FIG. 1B**, the computer **102** may store computer programs for creating or editing a graphical program, such, such as a graphical program that is involved with the automation function performed by the automation system **160**.

[**0041**] The one or more devices may include a data acquisition board **114** and associated signal conditioning circuitry **124**, a PXI instrument **118**, a video device **132** and associated image acquisition card **134**, a motion control device **136** and associated motion control interface card **138**, a fieldbus device **170** and associated fieldbus interface card **172**, a PLC (Programmable Logic Controller) **176**, a serial instrument **182** and associated serial interface card **184**, or a distributed data acquisition system, such as the Fieldpoint system available from National Instruments, among other types of devices. The devices may be coupled to the device or process **150**.

[**0042**] In typical instrumentation and/or industrial automation systems a device will not be present of each interface type, and in fact many systems may only have one or more devices of a single interface type.

[**0043**] Referring again to **FIGS. 1A and 1B**, the computer system **102** preferably includes a memory medium on which one or more computer programs are stored. The one or more programs may include user interfaces implementing one or more hierarchies of palette windows. The one or more hierarchies of palette windows may include an improved navigation interface according to one embodiment of the present invention. The improved navigation interface may provide browser-type navigation items as described herein that may provide an interface similar to an Internet web browser. The improved navigation interface may provide that at most one palette window in a hierarchy is displayed at one time, and may include improved search capabilities, among other features described herein.

[**0044**] The term "memory medium" is intended to include an installation medium, e.g., a CD-ROM, floppy disks **104**, or tape device, a computer system memory or random access memory (RAM) such as DRAM, SRAM, EDO RAM, Rambus RAM, etc., or a non-volatile memory such as a magnetic media, e.g., a hard drive, or optical storage. The memory medium may comprise other types of memory as well, or combinations thereof.

[**0045**] In addition, the memory medium may be located in a first computer in which the programs are executed, or may be located in a second different computer, which connects to the first computer over a network, such as the Internet. In the latter instance, the second computer provides the program instructions to the first computer for execution. Also, the computer system **102** may take various forms, including a personal computer system, mainframe computer system, workstation, network appliance, Internet appliance, personal digital assistant (PDA), television system or other device. In general, the term "computer system" can be broadly defined to encompass any device having at least one processor, which executes instructions from a memory medium.

[**0046**] As noted above, in the exemplary embodiment described herein, the one or more hierarchies of palette windows include palette items used in creating a graphical program. The graphical program that is created may be designed for data acquisition/generation, analysis, and/or display, and for controlling or modeling instrumentation or industrial automation hardware. An exemplary graphical programming development system that may be used to develop the graphical program is the National Instruments LabVIEW graphical programming application. LabVIEW provides specialized support for developers of instrumentation and industrial automation applications.

[**0047**] However, it is noted that the present invention may be used in a plethora of applications and is not limited to graphical programming applications including instrumentation or industrial automation applications. In other words, **FIGS. 1A and 1B** are exemplary only, and embodiments of the present invention may be used in any of various types of systems or applications that use one or more hierarchies of palette windows.

FIG. 2—Computer System Block Diagram

[**0048**] **FIG. 2** is a block diagram of the exemplary computer system illustrated in **FIGS. 1A and 1B**. It is noted that any type of computer system configuration or architecture

can be used as desired, and **FIG. 2** illustrates a representative PC embodiment. The elements of a computer not necessary to understand the present invention have been omitted for simplicity.

[**0049**] The computer **102** includes at least one central processing unit or CPU **160** that is coupled to a processor or host bus **162**. The CPU **160** may be any of various types, including an x86 processor, e.g., a Pentium class, a PowerPC processor, a CPU from the SPARC family of RISC processors, as well as others. Main memory **166** is coupled to the host bus **162** by means of memory controller **164**.

[**0050**] The main memory **166** stores computer programs according to one embodiment. More particularly, in this embodiment, the main memory **166** may store a graphical programming development system which includes a user interface having one or more hierarchies of palette windows. The main memory **166** also stores operating system software as well as other software for operation of the computer system, as well known to those skilled in the art. The computer programs of one or more embodiments will be discussed in more detail below.

[**0051**] The host bus **162** may be coupled to an expansion or input/output bus **170** by means of a bus controller **168** or bus bridge logic. The expansion bus **170** of this embodiment may be the PCI (Peripheral Component Interconnect) expansion bus, although other bus types can be used. The expansion bus **170** includes slots for various devices such as the data acquisition board **114** (of **FIG. 2A**), a GPIB interface card **122** which provides a GPIB bus interface to the GPIB instrument **112** (of **FIG. 2A**), and a VXI or MXI bus card **186** coupled to the VXI chassis **116** for receiving VXI instruments. The computer **102** further comprises a video display subsystem **180** and hard drive **182** coupled to the expansion bus **170**.

FIG. 3—Graphical Programming Environment

[**0052**] **FIG. 3** is a block diagram illustrating one embodiment of the relationship of portions of an exemplary instrumentation control system **100** (of **FIG. 1A**) or the automation system **160** (**FIG. 1B**). The elements shown in **FIG. 3** (with the exception of the instrument hardware **54**) may be software elements, which are executed on the computer **102** (of **FIG. 1A** or 1B). The exemplary system described herein may be used to create a graphical program, or graphical program portion, to provide an interface to one or more instruments connected to the computer system on which the program is executed.

[**0053**] The block diagram editor **64** is operable to create a block diagram or VI **50**, and the front panel editor **62** is operable to create a front panel or user interface. A graphical program comprises the block diagram and may also comprise the front panel. The block diagram editor **64** communicates with the graphical program nodes **66**, which in turn communicate with the graphical programming development system **68**. In a similar manner, the front panel editor **62** communicates with the front panel controls **74**, which in turn communicate with the graphical programming development system **68**.

[**0054**] A programmer may employ the front panel editor **62**, the block diagram editor **64**, and a connector pane/icon editor **72** of a graphical programming system to produce a graphical program. In the exemplary instrumentation application, the graphical program may be referred to as a virtual instrument (VI) **50**. The VI **50** may include one or more nodes or blocks that may be connected or coupled together as specified by the user.

[**0055**] The graphical programming environment comprises one or more graphical program nodes **66** that may be selected for inclusion in a graphical program block diagram. The block diagram editor **64** may include one or more palette windows which include nodes **66** (or icons representing the nodes) that may be selected for inclusion in the block diagram being created. The block diagram editor **64** may also generate executable instructions, i.e., machine language instructions, in response to the VI **50**. The VI **50** developed by the programmer is executed by an execution subsystem **56** of the graphical programming environment to control an instrument **54**. The instrument **54** is illustrative of instruments such as those of **FIG. 1**.

[**0056**] Referring again to **FIG. 3**, the graphical programming environment further comprises one or more front panel controls or graphical user interface (GUI) elements **74**. The front panel editor **62** is operable to generate a front panel or GUI using one or more of the controls **74**. The front panel editor **62** may include one or more palette windows that include user interface elements or controls **74** (icons representing the controls) that may be selected for inclusion in the front panel or user interface being created.

[**0057**] The graphical programming environment may further comprise a connector pane/icon editor **72** for forming VI's into subVI's, i.e., a VI **50** that may be used as a graphical programming element in another VI. The reader is referred to U.S. Pat. No. 5,301,336 for more information about the subVI's and the icon editor **72**.

[**0058**] The execution subsystem **56** executes the executable instructions constructed from a block diagram and/or front panel of the VI **50**. For more information about the graphical programming development system, please see U.S. Pat. No. 5,481,741, which is hereby incorporated by reference as though fully and completely set forth herein.

FIGS. **5A-10**—Improved Palette Window Navigation

[**0059**] Various types of computer programs may include one or more hierarchies of palette windows comprising an embodiment of the invention as described herein. For example, a software program may be launched to perform a task. The software program may display palette windows from a hierarchy of palette windows that provide a user interface to various aspects of the program. In one embodiment, the software program may be a graphical programming application that allows the user to graphically create and/or edit computer-executable programs. **FIGS. 5A-10** illustrate an exemplary graphical programming environment in which the various aspects of the present invention may be implemented. It is noted, however, that the various aspects of the present invention may be applied to any computer-executable program or application that uses one or more hierarchies of palette windows.

[**0060**] In one embodiment, one or more palette windows may be opened automatically in response to a program action, such as the opening of a window related to the elements in the palette windows. For example, in the exemplary graphical programming environment, opening a user interface window and/or a function block diagram window

may result in one or more palette windows being automatically opened. Alternatively, the user may open palette windows through an application's user interface, for example, by choosing a menu item to select and/or display one or more palette windows.

[0061] An exemplary graphical programming application may open one or more windows, which may include user interface windows and/or block diagram windows, upon launch of the application. Alternatively, user interface windows and/or block diagram windows may be opened by the user subsequent to the launching of the application using the application's user interface. A user may add, delete or modify various user interface elements in a user interface window. User interface elements, e.g. controls and indicators, may represent or display various inputs and outputs of the graphical program, and/or may represent interfaces to items, for example, device interfaces in a virtual instrument (VI) program. The user interface window may also include user interface elements that, when selected, open or display one or more other user interface windows for accessing other aspects of the graphical program.

[0062] A block diagram window may include one or more function nodes or program elements, such as terminals, that may correspond to user interface elements in a user interface window and nodes that embody a function. The nodes or function elements may represent executable functions or executable software modules. The nodes or function elements may be interconnected or "wired up" to visually indicate functionality of the graphical program, wherein the nodes perform various operations during execution of the graphical program.

[0063] A palette window may include palette items (also called "program elements") and palette window selection items.

[0064] Palette items may be selectable to perform various program functions, e.g., palette items may be selected to display the corresponding icon in a window or may be selected to perform a desired function. Palette items may be represented graphically or as text items, for use in constructing windows, for example, graphical user interface windows and block diagram windows. In one embodiment, a palette item may be placed on a window by selecting the item in a palette window, and "dragging and dropping" the item on the window. Other methods of adding items to windows may be used. For example, in one embodiment, a user may select an item in a palette window, and a menu choice may then be selected to add the selected item to a window.

[0065] In a hierarchy of palette windows used in creating a graphical user interface in the graphical user interface window, the palette items in the palette windows may include user interface elements to be displayed in the graphical user interface window. In one embodiment, user interface elements may be classified into two main groups: control (input) items, and indicator (output) items. Some items may support both input and output. Examples of control and indicator items that may be included in a palette window include, but are not limited to: Boolean interface items such as switches and buttons; 2- and 3-dimensional graphs and charts; textual items such as text fields, lists and tables; and numeric interface items such as gauges, digital controls, analog controls such as knobs, etc.

[0066] In a hierarchy of palette windows used in creating a block diagram in the block diagram window, the palette items in the palette windows may include functions nodes (also called function elements or primitives) to be displayed in the block diagram window. Examples of types of function elements may include, but are not limited to: program structures such as for and while loops, case statements, and global or local variables; operators such as numeric (addition, multiplication, etc.), comparison (equal to, greater than, etc) and logical (AND, OR, XOR, etc) operators; file I/O items; signal or waveform processing function elements; complex mathematical function elements; instrument driver items; communications items; and graphical or sound items.

[0067] Some embodiments may include a plurality of hierarchies of palette windows. For example, in the exemplary graphical programming environment, a first hierarchy may include user interface elements for use in creating a user interface, and a second hierarchy may include function elements or nodes for use in creating a block diagram.

[0068] Individual palette windows may include related groups of elements. For example, in the exemplary graphical programming environment, in the first hierarchy a first palette window may include graph and chart user interface elements, a second palette window may include Boolean user interface elements, and a third palette window may include digital user interface elements, etc. In a similar manner, in the second hierarchy a first palette window may include numeric operator function elements, a second palette window may include signal processing function elements, and a third palette window may include Boolean operator elements, etc.

[0069] Palette window selection items in a palette window may be selected to display a lower level palette window in the hierarchy. Thus, palette window selection items are one mechanism for navigating among the hierarchy of palette windows. In one embodiment, a first palette window may include one or more palette window selection items that, when selected, open a second palette window that may be referred to as a child of the first (parent) palette window. When the child palette window is opened, the parent (current) palette window may be automatically closed. Thus, in one embodiment, at most one palette window in a hierarchy is displayed at one time.

[0070] Thus, unlike palette items or program elements that may be selected to perform a function, such as being selected to be added to a window, the palette window selection items are selected primarily (or only) for the purpose of displaying lower level palette windows in the hierarchy.

[0071] Some palette windows in a hierarchy may comprise only palette window selection items. For example, the "root" or top-level palette window may include only palette window selection items for selecting other palette windows to be displayed. Other palette windows (e.g. the lowest palette windows in the hierarchy) may comprise only palette items and may not include any palette window selection items. Yet other windows may comprise a combination of palette window selection items and palette items. For example, in one embodiment of a graphical programming application, palette windows may include palette window selection items and palette items representing selectable program elements such as user interface elements and/or function elements.

[0072] In one embodiment, the palette window selection items may include an indicator to distinguish these selection

items from palette items or other items in the palette window. For example, a selection item may include a graphical indicator, such as an arrow, that identifies the item as a palette window selection item that references a lower level palette window.

Palette Window Navigation Items

[0073] In one embodiment of the invention, palette windows in a hierarchy may include one or more navigation items for navigating among the hierarchy of palette windows. In one embodiment, the navigation items may be comprised in a navigation toolbar. The navigation toolbar may be displayed at the top of each palette window. In one embodiment, the navigation items may include one or more of a back navigation item, a forward navigation item, and an up navigation item. In one embodiment, the back navigation item may be represented as a back arrow, the forward navigation item may be represented as a forward arrow, and the up navigation item may be represented as an up arrow.

[0074] The back navigation item may be operable when selected to open or display a most recently previously displayed palette window in a backward direction. The forward navigation item may be operable when selected to open or display a most recently previously displayed palette window in a forward direction. The up navigation item may be operable when selected to open or display a parent palette window of the current palette window, regardless of the most recently previously displayed palette window. Various other navigation items may be included which perform other types of navigation.

[0075] The navigation items may be used in navigating to previously displayed (or non-previously displayed) palette windows and other windows in the program. In one embodiment, a navigation item may be used to list and optionally select from the palette windows that are higher in the hierarchy of palette windows than the currently displayed palette window. In another embodiment, a navigation item may be used to list and optionally select from the palette windows that are lower in the hierarchy of palette windows than the currently displayed palette window.

[0076] When a palette window is opened or displayed using one of the navigation items, the current palette window is closed or no longer displayed. Thus, in one embodiment, at most one palette window in a hierarchy is displayed at one tine. For example, when a previously displayed palette window, or one higher in the hierarchy, is opened using one of the navigation items, the current palette window is closed or no longer displayed.

[0077] In one embodiment, when there is no previously displayed palette window from the current palette window, or when there is no palette window higher (or lower) in the hierarchy than the current window, one or more of the navigation items may be disabled.

[0078] In one embodiment, a mechanism for searching for palette windows and/or palette window content (e.g. program elements and palette window selection items) may be provided. In one embodiment, a search window may be opened from any palette window in the hierarchy. The search window may provide an interface to allow the user to search for and locate palette windows and/or palette window content in the hierarchy of palette windows. From the search window, the user may directly open located palette windows in the hierarchy. The various navigation items may still operate after a search to return to the previously displayed palette window in which the search originated. In one embodiment, the search window may also include one or more navigation items operable when selected to open or display previously displayed palette windows from the search window.

FIGS. 5A-5E—Navigating Among a Hierarchy of Palette Windows

[0079] **FIGS. 5A-5E** illustrate an exemplary graphical user interface (of a graphical programming environment) used to illustrate various embodiments of a method for navigating among a hierarchy of palette windows using graphical palette window selection items. It is noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses one or more hierarchies of palette windows.

[0080] In the exemplary graphical programming environment, program elements (also called "palette items") may be added to windows (e.g. block diagram or user interface windows of a program currently being created or modified in the exemplary graphical programming application) from the hierarchies of palette windows **200** as illustrated in **FIG. 5A-5E**. The program elements may be represented as graphical objects in the palette windows **200**.

[0081] Palette windows **200** as illustrated in **FIGS. 5A-5E** may include a palette **204** of one or more graphical items which may include palette window selection items **208** (for example, graph palette window selection item **208**A of **FIG. 5A**), program elements **212** (for example, user interface element **212**A of **FIG. 5C**), and utility items **210** (for example, utility item **210**A of **FIG. 5A** for displaying an interface for selecting custom controls). Each item may include a graphical or textual indication of the type of item it is, and may include graphical and/or textual indications of the palette window, program element, etc. that it represents. In the palette windows **200** illustrated in **FIGS. 5A-5E**, a triangle or arrow at the upper right corner of an item may indicate that the item is a palette window selection item **208**, an ellipsis at the bottom of an item may indicate that the item is a utility item **210**, and the absence of an indicator may indicate that the item is a program element **212**. Other embodiments may include other types of items. Other embodiments may also use other graphical or textual indicators for identifying item types to users.

[0082] In one embodiment as illustrated in **FIG. 5B**, when a user selects an item, for example, by moving cursor **226** over the item, a description of the item may be displayed in the palette window. In this example, "Graph" appears above the items in the palette **204** for selected palette window selection item **208**A, indicating that a palette window associated with item **208**A may include one or more items related to adding graph functionality to a program. Upon selecting palette window selection item **208**A of palette window **200**A, for example, by clicking or double-clicking the item, a second palette window **200**B is displayed as illustrated in **FIG. 5C**, and palette window **200**A is closed. In this example, palette window **200**A may be described as a parent of palette window **200**B, and palette window **200**B as a child of palette window **200**A. In this example, items in palette window **200**B may be related to adding graph functionality to a program currently being created or modified.

[0083] Upon selecting palette window selection item **208**B of palette window **200**B as illustrated in **FIG. 5D**, a third palette window **200**C is displayed as illustrated in **FIG. 5E**, and palette window **200**B is closed. In this example, palette window **200**B may be described as a parent of palette window **200**C, and palette window **200**C as a child of palette window **200**B. In this example, items in palette window **200**C may be related to adding picture graphs to a program currently being created or modified. For example, user interface element **212**B may be added to a user interface window in a program currently being created or modified, for example, by dragging and dropping the item on the user interface window. Palette window **200**C may also include one or more palette window selection items **208**, for example, item **208**C, which display child palette windows **200** of palette window **200**C when selected. By selecting other palette window selection items **208** on one of the palette windows **200** as illustrated in **FIGS. 5A-5E**, other branches of the hierarchy of palette windows may be displayed.

[0084] Note that, unlike prior art palette windows, previously opened palette windows **200** in the hierarchy are not displayed when a child palette window of a current palette window is displayed. Thus, in the present invention, there is no limitation imposed by keeping palette windows open as there is for the palette windows as illustrated in **FIGS. 4A-4D**. This operates to present more of a web browser type interface.

[0085] Palette windows **200** as illustrated in **FIGS. 5A-5E** may also include one or more navigation items for navigating among the hierarchy of palette windows **200**. **FIG. 5A** illustrates one embodiment of a palette window **200**A with several navigation items comprised in a navigation toolbar **214**. The navigation items in this embodiment may include one or more of a back navigation item **216**, a forward navigation item **218**, and an up navigation item **220**. In one embodiment, palette windows **200** may also include a back navigation menu item **217**, a forward navigation menu item **219**, and an up navigation menu item **221**.

[0086] After using the palette window selection items **208** to display two or more palette windows as described above for **FIGS. 5A-5E**, the back and forward navigation items **216** and **218** may be used to navigate to previously displayed palette windows in a backward and forward direction. For example, the selection of back navigation item **216** of palette window **200**C of **FIG. 5E** causes palette window **200**B of **FIG. 5C** (the most recently displayed palette window in a backward direction) to be displayed, and palette window **200**C to be closed. Subsequently selecting back navigation item **216** of palette window **200**B of **FIG. 5C** causes palette window **200**A of **FIG. 5A** (the next previously displayed palette window in the backward direction) to be displayed and palette window **200**B to be closed.

[0087] From palette window **200**A, forward navigation item **218** may then be selected to display palette window **200**B of **FIG. 5C** (the most recently displayed palette window in the forward direction) and close palette window **200**A. Subsequently selecting forward navigation item **218** from palette window **200**B of **FIG. 5C** results in palette window **200**C of **FIG. 5E** (the next palette window in the forward direction) being displayed, and palette window **200**B being closed.

[0088] After using the palette window selection items **208** to display two or more palette windows as illustrated in **FIGS. 5A-5E**, the back and forward navigation menu items **217** and **219** may also be used to navigate to previously displayed palette windows in a backward and forward direction. Selecting a navigation menu item may result in the display of a menu including menu items for one or more previously displayed palette windows **200**. Selecting a menu item for one of the palette windows **200** from the menu causes the selected palette window **200** to be displayed and the currently displayed palette window **200** to be closed.

[0089] For example, the selection of back navigation menu item **217** of palette window **200**C of **FIG. 5E** may display a menu including menu items for all previously displayed palette windows in a backward direction (in this example, palette window **200**B of **FIG. 5C** and palette window **200**A of **FIG. 5A**). Selecting the menu item for palette window **200**A from the menu causes palette window **200**A to be displayed and palette window **200**C to be closed. Subsequently selecting the forward navigation menu item **219** of palette window **200**A of **FIG. 5A** may display a menu including menu items for all previously displayed palette windows in a forward direction (in this example, palette window **200**B of **FIG. 5C** and palette window **200**C of **FIG. 5E**). Selecting the menu item for palette window **200**B from the menu causes palette window **200**B to be displayed and palette window **200**A to be closed.

[0090] The up navigation item **220** may be used to navigate to palette windows higher in the hierarchy of palette windows than the currently displayed palette window. For example, the selection of up navigation item **220** of palette window **200**C of **FIG. 5E** causes palette window **200**B of **FIG. 5C** (the parent palette window of palette window **200**C) to be displayed, and palette window **200**C to be closed. Subsequently selecting up navigation item **220** of palette window **200**B of **FIG. 5C** causes palette window **200**A of **FIG. 5A** (the parent palette window of palette window **200**B) to be displayed and palette window **200**B to be closed. Note that, in this example, if palette window **200**A is the root palette window (i.e. has no parent) then selecting up navigation item **220** of palette window **200**A will have no effect.

[0091] The up navigation menu item **221** may also be used to navigate to palette windows higher in the hierarchy of palette windows than the currently displayed palette window. For example, the selection of up navigation menu item **221** of palette window **200**C of **FIG. 5E** may display a menu including menu items for all palette windows higher in the hierarchy than palette window **200**C (in this example, palette window **200**B of **FIG. 5C** and palette window **200**A of **FIG. 5A**). Selecting the menu item for one of the palette windows **200** from the menu causes the selected palette window **200** to be displayed and palette window **200**C to be closed.

[0092] In one embodiment, palette windows **200** may also include a search item **222**. In one embodiment, palette windows **200** may also include an item **224** that, when selected, displays a user interface for changing the configuration, display characteristics, etc. of palette windows in the hierarchy. In one embodiment, the user interface may allow the user to toggle the palette window to display items in palette windows in either textual format (as illustrated in

FIG. 6A), graphical format (as illustrated in **FIG. 5A**) or optionally in a combination of graphical and textual. In one embodiment, the user interface may also allow palette window selection items **208** to be added to and/or removed from palette windows **204**, thus providing a method for the user to modify the hierarchy of palette windows.

FIGS. **6A-6C**—Palette Windows with Text Palette Window Selection Items

[**0093**] **FIGS. 6A-6C** illustrate an exemplary graphical programming environment used to illustrate various embodiments of a method for navigating among a hierarchy of palette windows using textual palette window selection items. It is noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses one or more hierarchies of palette windows.

[**0094**] In the exemplary graphical programming environment, program elements may be added to windows (e.g. a functional or user interface windows of a program currently being created or modified) from hierarchy of palette windows **240** with textual palette window selection items as illustrated in **FIG. 6A-6C**. The program elements may be represented as text objects in the palette windows **240**.

[**0095**] Palette windows **240** as illustrated in **FIGS. 6A-6C** may include a list **242** of one or more text items including palette window selection text items **244** (for example, graph palette window selection text item **244**A of **FIG. 6A**), program elements **248** (for example, user interface element **248**A of **FIG. 6C**), and utility items **246** (for example, utility item **246**A of **FIG. 6A**).

[**0096**] In one embodiment as illustrated in **FIG. 6B**, when a user selects a text item from the list **242**, for example, by moving cursor **226** over the text item, the text item may be highlighted. In this example, the selected palette window selection text item **244**A "Graph" is highlighted. Upon selecting palette window selection text item **244**A of palette window **240**A, for example, by clicking or double-clicking the item, a second palette window **240**B is displayed as illustrated in **FIG. 6C**, and palette window **240**A is closed. In this example, palette window **240**A may be described as a parent of palette window **240**B, and palette window **240**B as a child of palette window **240**A.

[**0097**] In this example, items in palette window **240**B may be related to adding charts and graphs to a program currently being created or modified. For example, user interface element **248**A may be added to a user interface window in a program currently being created or modified, for example, by dragging and dropping the item on the user interface window. Palette window **240**B may also include one or more palette window selection text items **244**, for example item **244**B, which display child palette windows **240** of palette window **24**B when selected. By selecting other palette window selection text items **244** on one of the palette windows **240** as illustrated in **FIGS. 6A-6C**, other branches of the hierarchy of palette windows may be displayed.

[**0098**] Palette windows **240** as illustrated in **FIGS. 6A-6C** may also include one or more navigation items for navigating among the hierarchy of palette windows **240**. **FIG. 6A** illustrates one embodiment of a palette window **240**A with several navigation items comprised in a navigation toolbar **214**. The navigation items in this embodiment may include back navigation item **216**, forward navigation item **218**, and up navigation item **220**. In one embodiment, palette windows **240** may also include back navigation menu item **217**, forward navigation menu item **219**, and up navigation menu item **221**.

[**0099**] After using the palette window selection items **208** to display two or more palette windows as described above for **FIGS. 6A-6C**, the back and forward navigation items **216** and **218** may be used to navigate to previously displayed palette windows in a backward and forward direction. For example, the selection of back navigation item **216** of palette window **240**B of **FIG. 6C** causes palette window **240**A of **FIG. 6A** (the most recently displayed palette window in a backward direction) to be displayed, and palette window **240**B to be closed. From palette window **240**A, forward navigation item **218** may then be selected to display palette window **240**B of **FIG. 6C** (the most recently displayed palette window in the forward direction) and close palette window **240**A.

[**0100**] After using the palette window selection items **208** to display two or more palette windows as illustrated in **FIGS. 6A-6C**, the back and forward navigation menu items **217** and **219** may also be used to navigate to previously displayed palette windows in a backward and forward direction. Selecting a navigation menu item may result in the display of a menu including menu items for one or more previously displayed palette windows **240**. Selecting a menu item for one of the palette windows **240** from the menu causes the selected palette window **240** to be displayed and the currently displayed palette window **240** to be closed.

[**0101**] For example, the selection of back navigation menu item **217** of palette window **240**B of **FIG. 6C** may display a menu including menu items for all previously displayed palette windows in a backward direction (in this example, palette window **240**A of **FIG. 6A**). Selecting the menu item for palette window **240**A from the menu causes palette window **240**A to be displayed and palette window **240**B to be closed. Subsequently selecting the forward navigation menu item **219** of palette window **240**A of **FIG. 6A** may display a menu including menu items for all previously displayed palette windows in a forward direction (in this example, palette window **240**B of **FIG. 6C**). Selecting the menu item for palette window **240**B from the menu causes palette window **240**B to be displayed and palette window **240**A to be closed.

[**0102**] The up navigation item **220** may be used to navigate to palette windows higher in the hierarchy of palette windows than the currently displayed palette window. For example, the selection of up navigation item **220** of palette window **240**B of **FIG. 6C** causes palette window **240**A of **FIG. 6A** (the parent palette window of palette window **240**B) to be displayed, and palette window **240**B to be closed. Note that, in this example, if palette window **240**A is the root palette window (i.e. has no parent) then selecting up navigation item **220** of palette window **240**A will have no effect.

[**0103**] The up navigation menu item **221** may also be used to navigate to palette windows higher in the hierarchy of palette windows than the currently displayed palette window. For example, the selection of up navigation menu item **221** of palette window **240**B of **FIG. 6C** may display a menu including menu items for all palette windows higher in the

hierarchy than palette window **240**B (in this example, palette window **240**A of **FIG. 6A**). Selecting the menu item for palette window **240**A from the menu causes the selected palette window **240**A to be displayed and palette window **240**B to be closed.

[**0104**] In one embodiment, palette windows **240** may also include search item **222**. In one embodiment, palette windows **240** may also include an item **224** that, when selected, displays a user interface for changing the configuration, display characteristics, etc. of palette windows in the hierarchy. In one embodiment, the user interface may allow the user to toggle the palette window to display items in the palette windows in either textual format (as illustrated in **FIG. 6A**) or graphical format (as illustrated in **FIG. 5A**). In one embodiment, the user interface may also allow palette window selection text items **244** to be added to and/or removed from list **242**, thus providing a method for a user to modify the hierarchy of palette windows.

FIGS. **7**A-7D—A Search Window for Locating Palette Windows in a Hierarchy

[**0105**] **FIGS. 7A-7D** illustrate an exemplary graphical user interface (in a graphical programming development environment application) with a search window **300** for locating palette windows and palette window content in a hierarchy of palette windows according to one embodiment. It is noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses one or more hierarchies of palette windows.

[**0106**] In one embodiment, palette windows such as those illustrated in **FIGS. 5A and 6A** may include a search item **224** that, when selected, displays search window **300**. For example, a user may select search item **244** from palette window **200**A of **FIG. 5A**, resulting in search window **300** of **FIG. 7A** being displayed. In one embodiment, the palette window from which the search window **300** was selected may be automatically closed when the search window **300** opens.

[**0107**] Search window **300** may also include one or more navigation items for navigating among the hierarchy of palette windows. **FIG. 7A** illustrates one embodiment of a search window **300** with several navigation items comprised in a navigation toolbar **214**. The navigation items in this embodiment may include back navigation item **216**, forward navigation item **218**, and up navigation item **220**. In one embodiment, search window **300** may also include back navigation menu item **217**, forward navigation menu item **219**, and up navigation menu item **221**.

[**0108**] Search window **300** may also include a search field **302** configured to accept user input for searching for palette windows and/or palette window content. Search window **300** may also include a list **306** of text entries or strings that may include palette window titles and program element names. In one embodiment, the text entries in list **306** may be in alphabetical order. Search window **300** may also include a scroll bar **308** for viewing hidden portions of list **306**. In one embodiment, if the text entries currently in list **306** are all visible within search window **300**, the scroll bar may be hidden or disabled. Search window **300** may also include interface items **304** for modifying aspects of searches for strings in the list of text entries. In this example, two interface items **304** are shown that allow a user to toggle between searching for text entries beginning with a search string and searching for text entries including a search string.

[**0109**] **FIGS. 7B-7D** illustrate using search window **300** to locate content (e.g. program objects) and/or palette windows. In **FIG. 7B**, a user may enter a text string in search field **302**. In this example, the user may enter the string "Recta" in search field **302**, and the list **306** of entries is reduced to entries including the entered string. In **FIG. 7C**, the user may enter the string "Rectangle" in search field **302**, and the list **306** is reduced to the one entry including the entire entered string. Note that if the user enters a string that is not included in any entries in list **306**, then the displayed list of entries may be empty.

[**0110**] The user may select a text entry, e.g. by clicking or double-clicking on a text entry in the list **306**, to display a palette window associated with the entry. For example, in **FIG. 7C**, the user may select (e.g. click on) the entry "Rectangle.ctl", and the "Datatypes" palette window **200**D illustrated in **FIG. 7D** may be displayed. Palette window **200**D includes the program element "Rectangle.ctl"**212**C corresponding with the "Rectangle.ctl" text entry in list **306** of search window **300** selected by the user. In one embodiment, if the palette windows are currently in text display mode, the items in the "Datatypes" palette window are displayed in text format similar to the items in the palette window **240**A as illustrated in **FIG. 6A**.

[**0111**] In one embodiment, the search window **300** may be closed when a palette window is displayed. Alternatively, the user may open a palette window from a list **306** including more than one text entry in search window **300** (for example, search window **300** as shown in **FIGS. 7A and 7B**) by selecting a text entry associated with the palette window from the list **306**, for example, by moving the cursor over the item and clicking or double-clicking it.

[**0112**] In one embodiment, list **306** of search window **300** may include one or more palette items. Palette items displayed in list **306**, similar to palette items in palette windows, may be selectable to perform various program functions, e.g., palette items may be selected to display the corresponding icon in a window being constructed, for example, graphical user interface windows and block diagram windows, or may be selected to perform a desired function. In one embodiment, a palette item may be placed on a window by selecting the item in list **306** and "dragging and dropping" the item on the window. Other methods of adding items from list **306** to windows may be used. For example, in one embodiment, a user may select an item in list **306** and a menu choice may then be selected to add the selected item to a window. Thus, the search results displayed in the search window may include palette items (e.g., icons) that can be selected, such as through a drag and drop method, directly from the search window, in a similar manner to which the palette item may be selected from its respective palette window.

FIGS. **8**A and **8**B—An Exemplary Palette Window with Navigation Items

[**0113**] **FIGS. 8A and 8B** illustrate a palette window in an exemplary graphical programming environment with navigation items for navigating among a hierarchy or hierarchies of palette windows according to one embodiment. It is

noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses a hierarchy or hierarchies of palette windows.

[0114] Palette windows **200**D as illustrated in **FIGS. 8A-8B** may include one or more navigation items for navigating among the hierarchy of palette windows. The navigation items may be comprised in a navigation toolbar **214**. The navigation items in this embodiment may include a back navigation item **216**, a forward navigation item **218**, and an up navigation item **220**. In one embodiment, palette window **200**D may also include a back navigation menu item **217**, a forward navigation menu item **219**, and an up navigation menu item **221**.

[0115] When navigating among a hierarchy of palette windows as illustrated in **FIGS. 5, 6**, and **7**, a user may generate a history of previously displayed windows. **FIG. 8A** illustrates using a back navigation item **216** to display a list **230**A of, and optionally select from, previously displayed windows. Any of several methods may be used to display the list **230**A. In one embodiment, the user may move cursor **226** over item **216** and click-hold (e.g. hold down the mouse button) for a short period until the list **230**A is displayed. In one embodiment, the user may select back navigation menu item **217** to display the list **230**A, for example, by clicking on it. The user may open one of the palette windows in list **230**A by selecting one of the items in list **230**A. For example, the user might move the cursor over and click on "Graph" in the list **230**A to display the "Graph" palette window **200**B as illustrated in **FIG. 5C**.

[0116] In one embodiment, the windows in the list **230**A may be shown in order from the most recently to the least recently previously displayed window. In other embodiments, other methods of ordering windows in list **230**A may be used. Depending on the sequence of navigation that the user has previously performed, the palette windows in the list may or may not be in a hierarchical, parent-child arrangement, where the immediate parent of the currently displayed palette window is the most recently previously displayed palette window. In the example as illustrated in **FIG. 8A**, "Picture" is the parent of "Datatypes", "Graph" is the parent of "Picture", and "Controls" is the parent of "Graph". If the user has previously navigated up and/or down other branches of the hierarchy or has used the search window **300** to "jump" to palette windows in other hierarchies or branches, then the palette windows may not be in a purely hierarchical arrangement in list **230**A.

[0117] In one embodiment, the most recently previously displayed window in a backward direction may be displayed by selecting back navigation item **216** without displaying or selecting from a menu. In one embodiment, single-clicking on back navigation item **216** may select the back navigation item. In this example, selecting back navigation item **216** of palette window **200**D may display the "Picture" palette window **200**C as illustrated in **FIG. 5E**.

[0118] **FIG. 8B** illustrates using an up navigation item **220** to display a list **230**B of, and optionally select from, palette windows above the currently displayed palette window **200**D on this branch of the hierarchy of palette windows, and optionally up to the root (first) palette window in the hierarchy. Any of several methods may be used to display the list **230**B. In one embodiment, the user may move cursor **226** over item **220** and click-hold (e.g. hold down the mouse button) for a short period until the list **230**B is displayed. In one embodiment, the user may select up navigation menu item **221** to display the list **230**B, for example, by clicking on it. The user may open one of the palette windows by selecting one of the items in list **230**B. For example, the user might move the cursor over and click on "Controls" in the list **230**B to display the "Controls" palette window **200**A as illustrated in **FIG. 5A**. The "Controls" palette window may be considered the root palette window in this hierarchy. Note that there may be other hierarchies reachable through the search window or by opening other windows in the graphical programming application that display palette windows in the other hierarchies when opened.

[0119] In one embodiment, the palette windows in the list **230**B may be shown in order from the immediate parent palette window of the currently displayed palette window to the root palette window of this hierarchy. In other embodiments, other methods of ordering palette windows in list **230**B may be used. In the example as illustrated in **FIG. 8B**, "Picture" is the parent of "Datatypes", "Graph" is the parent of "Picture", and "Controls" is the parent of "Graph".

[0120] In one embodiment, the parent palette window of the currently displayed palette window may be displayed by selecting up navigation item **220** without displaying or selecting from a menu. In one embodiment, single-clicking on up navigation item **220** may select the up navigation item. In this example, selecting up navigation item **220** of palette window **200**D may display the "Picture" palette window **200**C as illustrated in **FIG. 5E**, which is the parent palette window of palette window **200**D.

FIGS. 9A-9C—A Second Exemplary Palette Window with Navigation Items

[0121] **FIGS. 9A-9C** illustrate a second palette window **200**E in an exemplary graphical programming environment with several navigation items for navigating among a hierarchy of palette windows according to one embodiment to highlight other aspects of using the navigation items. It is noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses a hierarchy or hierarchies of palette windows.

[0122] Palette window **200**E as illustrated in **FIGS. 9A-9C** may include one or more navigation items for navigating among the hierarchy of palette windows, as well as for opening previously displayed windows in the program. The navigation items may be comprised in a navigation toolbar **214**. The navigation items in this embodiment may include a back navigation item **216**, a forward navigation item **218**, and an up navigation item **220**. In one embodiment, palette window **200**E may also include a back navigation menu item **217**, a forward navigation menu item **219**, and an up navigation menu item **221**.

[0123] When navigating among a hierarchy of palette windows as illustrated in **FIGS. 5, 6**, and **7**, a user may generate a history of previously displayed windows. **FIG. 9A** illustrates using a back navigation item **216** to display a list **230**C of, and optionally select from, previously displayed palette windows and/or other windows. Any of several methods may be used to display the list **230**C. In one embodiment, the user may select back navigation menu item

217 to display the list **230**C, for example, by clicking on it. The user may then open a previously displayed window by selecting one of the items in list **230**C. For example, the user might move the cursor over and click on "(search)" in the list **230**C to display the search window **300** as illustrated in **FIG. 7A**. As another example, the user might select "Datatypes" from list **230**C to open the Datatypes palette window as illustrated in **FIG. 8A**.

[**0124**] In one embodiment, the most recently previously displayed window in a backward direction may be displayed by selecting back navigation item **216** without displaying or selecting from a menu. In one embodiment, single-clicking on back navigation item **216** may select the back navigation item and thus display the most recently previously displayed window. In this example, selecting back navigation item **216** of palette window **200**E may display the "Search" window **300** as illustrated in **FIG. 7A**.

[**0125**] **FIG. 9B** illustrates using an up navigation item **220** to display a list **230**D of, and optionally select from, palette windows above the currently displayed palette window **200**E on this branch of the hierarchy of palette windows, and optionally up to the root (first) palette window in the hierarchy. Any of several methods may be used to display the list **230**D. In one embodiment, the user may select up navigation menu item **221** to display the list **230**D, for example, by clicking on it. The user may display a palette window higher in the hierarchy than the current palette window by selecting one of the items in list **230**D. For example, the user might move the cursor over and click on "Functions" in the list **230**D to display the "Functions" palette window. In this example, the "Functions" palette window may be the root palette window in a hierarchy of palette windows for adding function elements to graphical programs.

[**0126**] In one embodiment, the palette windows in the list **230**D may be shown in order from the immediate parent palette window of the currently displayed palette window to the root palette window of this hierarchy. In other embodiments, other methods of ordering palette windows in list **230**D may be used. In the example as illustrated in **FIG. 9B**, "Functions" is the parent palette window of "Numeric".

[**0127**] In one embodiment, the parent palette window of the currently displayed palette window may be displayed by selecting up navigation item **220** without displaying or selecting from a menu. In one embodiment, single-clicking on up navigation item **220** may select the up navigation item. In this example, selecting up navigation item **220** of palette window **200**E may display the "Functions" palette window, which is the parent palette window of palette window **200**E.

[**0128**] **FIG. 9C** illustrates using a forward navigation item **218** of palette window **200**A to display a list **230**E of, and optionally select from, previously displayed palette windows in a forward direction. In this example, list **230**E may have been generated using the back navigation item **216** of palette window **200**E to back up through all previously displayed windows in list **230**C of **FIG. 9A**. In this case, selecting forward navigation item **218** of palette window **200**A may display the "Graph" window **200**B as illustrated in **FIG. 5C**, which would be the most recently displayed window in a forward direction.

[**0129**] Any of several methods may be used to display the list **230**E. In one embodiment, the user may move cursor **226** over item **218** and click-hold (e.g. hold down the mouse button) for a short period until the list **230**E is displayed. In one embodiment, the user may select forward navigation menu item **219** to display the list **230**E, for example, by clicking on it. The user may open one of the palette windows by selecting one of the items in list **230**E. For example, the user might move the cursor over and click on "Numeric" in the list **230**E to display the "Numeric" palette window **200**E as illustrated in **FIG. 9A**.

[**0130**] In one embodiment, the palette windows in the list **230**E may be shown in order from the most recently to the least recently displayed palette window. In other embodiments, other methods of ordering palette windows in list **230**E may be used. Depending on the sequence of navigation that the user has previously performed, the palette windows in the list may or may not be in a hierarchical, parent-child arrangement, where the immediate parent of the currently displayed palette window is the most recently previously displayed palette window. If the user has previously navigated up and/or down other branches of the hierarchy or has used the search window **300** to "jump" to palette windows in other hierarchies or branches, then the palette windows may not be in a purely hierarchical arrangement in list **230**E.

[**0131**] In one embodiment, the most recently previously displayed window in a forward direction may be displayed by selecting forward navigation item **218** without displaying or selecting from a menu. In one embodiment, single-clicking on forward navigation item **218** may select the forward navigation item and thus display the most recently previously displayed window in a forward direction.

FIG. 10—A Hierarchical Organization of Palette Windows

[**0132**] **FIG. 10** shows an exemplary hierarchical organization of palette windows according to one embodiment. This example shows two hierarchies of palette windows in a graphical programming environment. It is noted, however, that the various aspects of the present invention illustrated in this example may be applied to any computer-executable program or application that uses one or more hierarchies of palette windows.

[**0133**] The root of the first hierarchy is palette window **200**A of **FIG. 5A**. The first hierarchy may include several palette windows for adding user interface elements to programs. The root of the firs hierarchy is palette window **200**H. The second hierarchy may include several palette windows for adding function elements to programs.

[**0134**] Each palette window in the hierarchy may have zero or more child palette windows. For example, palette windows **200**B and **200**E are children of palette window **200**A, palette window **200**J is a child of palette window **200**H, and palette window **200**D (among others) has no children. In one embodiment, a palette window may have at most one parent palette window. In another embodiment, a palette window may have more than one parent palette window.

[**0135**] Search window **300** may be accessed from palette windows in either the first or second hierarchy. From there, the user may navigate directly to any palette window in either hierarchy.

[**0136**] The following examples using the exemplary hierarchies of **FIG. 10** may be useful in distinguishing between

the functionality of the back navigation item **216**, the forward navigation item **218**, and the up navigation item **220** as illustrated in **FIGS. 9A-9C**. A user may begin at root palette window **200**A. Initially, all lists of palette windows displayed by navigation items may be empty. The user may open palette window **200**B, then palette window **200**C. At this point, the list of palette windows displayed by back navigation item **216** includes palette windows **200**A and **200**B, the list of palette windows displayed by forward navigation item **218** is empty, and the list of palette windows displayed by up navigation item **218** includes palette windows **200**A and **200**B. The user may use the back navigation item to back up to palette window **200**B. At this point, the list of palette windows displayed by back navigation item **216** includes palette window **200**A, the list of palette windows displayed by forward navigation item **218** includes palette window **200**C, and the list of palette windows displayed by up navigation item **218** includes palette window **200**A. The user may then use the back navigation item to back up to palette window **200**A. At this point, the list of palette windows displayed by back navigation item **216** is empty, the list of palette windows displayed by forward navigation item **218** includes palette windows **200**A and **200**B, and the list of palette windows displayed by up navigation item **218** is empty, as this is the root of the first hierarchy.

[**0137**] In one embodiment, if a user navigates up and down several branches, then the lists of palette windows displayed by navigation items may include palette windows from the different branches. For example, if the user next opened palette window **200**E from palette window **200**A, and then opened palette window **200**F from palette window **200**E, then the list of palette windows displayed by back navigation item **216** may include palette windows **200**E, **200**A, **200**B, and **200**C. If the user then used the back navigation item **216** to return to palette window **200**C, then the list of palette windows displayed by forward navigation item **218** may include palette windows **200**B, **200**A, **200**E, and **200**F.

Multiple Navigation Mode Embodiment

[**0138**] In one embodiment of the invention, the hierarchy of palette windows may have a plurality of different navigation modes, including the browser-based navigation mode described above with respect to **FIGS. 5A-10** as well as the prior art "cascading' navigation mode described with respect to **FIGS. 4A-4C**. For example, in one embodiment the user may "left click" on a palette window selection item in the palette to perform a browser based method as described above with respect to **FIGS. 5A-10**, and may "right click" on a palette window selection item in the palette to perform a cascading type navigation as shown in **FIGS. 4A-4C**. This allows the user the choice of selecting which type of palette navigation method the user prefers. The user may also reprogram the left and right mouse buttons of his/her mouse to configure the preferred method for the left or right mouse button, per the user's preference.

FIG. 11—Incorporating Program Elements from a Search Window

[**0139**] **FIG. 11** illustrates an example of incorporating a located program element from a search window into a window of a program being edited according to one embodiment. In this example, a user may search for program elements including the search string "Recta" as entered in search field **302** of search window **300** as previously described for **FIGS. 7A-7B**. A list **306** of text entries or strings that may include palette window titles and program element names may be displayed in the search window **300**. The user may select one or more program elements from the list to be incorporated into one or more windows **400** of a program currently being edited, for example, graphical user interface windows and block diagram windows. In this example, the user has selected the item "Labeled Rectangular Button" from the list and has incorporated a button of this type into a user interface window **400** of a program currently being edited.

[**0140**] In one embodiment, a program element may be incorporated into the program by selecting the item in list **306** and "dragging and dropping" the item on a window of the program. Other methods of incorporating items from list **306** into programs may be used. For example, in one embodiment, a user may select an item in list **306** and a menu choice may then be selected to add the selected item to a window of the program.

FIG. 12 Searching for, Locating and Incorporating Program Elements

[**0141**] **FIG. 12** is a flowchart of a method of searching for, locating and incorporating program elements according to one embodiment. As indicated at **500**, a search window **300** may be displayed on a computer display on which a program is being edited in a graphical programming system. In one embodiment, a user of the system may enter user input to cause the search window to be displayed. For example, a palette window may include a search item that the user may select to cause the search window to be displayed. The user may then enter search criteria into the search window as indicated at **502**. The system may then search for items indicated by the search criteria as indicated at **504**. At **506**, located items may be displayed. These located items may include one or more items related to program elements that may be incorporated in the program being edited to add functionality to the program. In one embodiment, the items may be displayed in the search window, for example, in a list of located elements as illustrated in **FIG. 11**. Optionally, the located items may be displayed in a different window.

[**0142**] The user may then select one or more located program elements and incorporate the one or more program elements in one or more windows of the program being edited as indicated at **508**. In one embodiment, a program element may be incorporated into the program by selecting the item in list **306** and "dragging and dropping" the item on a window of the program. Other methods of incorporating items from list **306** into programs may be used. For example, in one embodiment, a user may select an item in list **306** and a menu choice may then be selected to add the selected item to a window of the program. Thus, the search results displayed in the search window may include program elements that can be selected and incorporated, such as through a drag and drop method, directly from the search window into a window of the program being edited, in a similar manner to which a palette item (representing a program element) may be selected from its respective palette window and incorporated in a window of the program being edited.

[**0143**] Various embodiments may further include receiving, sending or storing instructions and/or data implemented

in accordance with the foregoing description upon a carrier medium. Generally speaking, a carrier medium may include storage media or memory media such as magnetic or optical media, e.g., disk or CD-ROM, volatile or non-volatile media such as RAM (e.g. SDRAM, RDRAM, SRAM, etc.), ROM, etc. as well as transmission media or signals such as electrical, electromagnetic, or digital signals, conveyed via a communication medium such as network and/or a wireless link.

[0144] Although the system and method of the present invention has been described in connection with the preferred embodiment, it is not intended to be limited to the specific form set forth herein, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents, as can be reasonably included within the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A computer-implemented method for adding program elements to programs, the method comprising:

displaying a program currently being edited in a first graphical user interface displayed on a computer system, wherein the computer system comprises a display;

displaying a search window on the display;

receiving user input to the search window specifying one or more search criteria;

identifying and displaying information indicating a plurality of possible program elements in the search window in accordance with the one or more search criteria;

receiving user input to the search window selecting a program element from the plurality of possible program elements indicated in the search window; and

including the selected program element in the program in response to said receiving user input to the search window selecting the program element.

2. The method of claim 1, wherein the plurality of possible program elements are selectable by the user from the search window to add functionality to the program.

3. The method of claim 1,

wherein the program includes a graphical user interface, wherein the graphical user interface of the program is different from the first graphical user interface, wherein during execution of the program, one or more elements of the graphical user interface of the program are operable to receive and/or output information;

wherein the plurality of possible program elements includes graphical user interface elements which are each selectable by the user to add a particular graphical user interface function associated with a particular graphical user interface element of the one or more elements of the graphical user interface of the program.

4. The method of claim 1, wherein the plurality of possible program elements includes function elements each selectable by the user to add a particular computer-executable function.

5. The method of claim 1, wherein said including the selected program element in the program comprises receiving user input to drag-and-drop the selected program element to the program.

6. The method of claim 1, wherein the user input in the search window specifying the one or more search criteria includes a search string, and wherein said identifying and displaying information indicating the plurality of possible program elements in the search window in accordance with the one or more search criteria comprises:

searching for the search string in a plurality of text items comprising text items related to the plurality of possible program elements; and

displaying one or more text items located by said searching for the search string, wherein each of the one or more located text items includes the search string, and wherein each of the one or more located text items references one of the plurality of possible program elements.

7. The method of claim 6, wherein the user input selecting the program element from the plurality of possible program elements specifies one of the one or more located text items, wherein the specified located text item references the selected program element.

8. The method of claim 1, wherein said displaying the search window is performed in response to user input to the first graphical user interface.

9. The method of claim 1,

wherein the program is a graphical program comprising a plurality of connected nodes which visually indicates functionality of the graphical program;

wherein one or more of the plurality of possible program elements comprise possible nodes for inclusion in the graphical program.

10. The method of claim 9,

wherein the graphical program is a data flow graphical program.

11. A system comprising:

a processor;

a memory which stores program instructions, wherein the memory is coupled to the processor;

an input device configured to receive user input, wherein the input device is coupled to the processor; and

a display device, wherein the display device is coupled to the processor;

wherein the program instructions are executable by the processor to:

display on the display a program currently being edited;

display a search window on the display;

receive user input to the search window specifying a one or more search criteria;

identify and display information indicating a plurality of possible program elements in the search window in accordance with the one or more search criteria;

receive user input to the search window selecting a program element from the plurality of possible program elements indicated in the search window; and

include the selected program element in the program in response to the user input to the search window selecting the program element.

12. The system of claim 11,

wherein the program comprises a graphical user interface;

wherein the plurality of possible program elements are selectable by the user from the search window to add functionality to the graphical user interface of the program.

13. The system of claim 11,

wherein the program includes a graphical user interface, wherein during execution of the program, one or more elements of the graphical user interface of the program are operable to receive and/or output information;

wherein the plurality of possible program elements includes graphical user interface elements which are each selectable by the user to add a particular graphical user interface function associated with a particular graphical user interface element to the program.

14. The system of claim 11, wherein the plurality of possible program elements includes function elements each selectable by the user to add a particular computer-executable function associated with the particular function element to the program.

15. The system of claim 11, wherein, in said including the selected program element in the first window, the program instructions are further executable by the processor to:

receive user input to drag-and-drop the selected program element from the search window to the program.

16. The system of claim 11, wherein the user input in the search window specifying the one or more search criteria includes a search string, and wherein, in said identifying and displaying information regarding the plurality of possible program elements in the search window, the program instructions are further executable by the processor to:

search for the search string in a plurality of text items comprising text items related to the program elements; and

display one or more text items located by said searching for the search string, wherein each of the one or more located text items includes the search string, and wherein each of the one or more located text items references one of the plurality of possible program elements;

wherein the user input selecting the program element from the plurality of possible program elements specifies one of the one or more located text items, wherein the specified located text item references the selected program element.

17. The system of claim 11,

wherein the program is a graphical program comprising a plurality of connected nodes which visually indicates functionality of the graphical program;

wherein one or more of the plurality of possible program elements comprise possible nodes for inclusion in the graphical program.

18. A carrier medium comprising program instructions, wherein the program instructions are computer-executable to implement:

displaying a program on a display of a computer system;

displaying a search window on the display of the computer system;

receiving user input to the search window specifying one or more search criteria;

identifying and displaying information indicating a plurality of possible program elements in the search window in accordance with the one or more search criteria, wherein the plurality of possible program elements are selectable by the user from the search window to add functionality to the program;

receiving user input to the search window selecting a program element from the plurality of possible program elements indicated in the search window; and

including the selected program element in the program in response to said receiving user input to the search window selecting the program element.

19. The carrier medium of claim 18, wherein said including the selected program element in the first window comprises receiving user input to drag-and-drop the selected program element from the search window to the program.

20. The carrier medium of claim 18, wherein the program instructions are further computer-executable to implement:

displaying a first palette window of a hierarchy of palette windows, wherein one or more of the palette windows in the hierarchy each comprise one or more palette items that represent one of the plurality of possible program elements.

21. The carrier medium of claim 18,

wherein the program is a graphical program comprising a plurality of connected nodes which visually indicates functionality of the graphical program;

wherein one or more of the plurality of possible program elements comprise possible nodes for inclusion in the graphical program.

22. The carrier medium of claim 21,

wherein the graphical program is a data flow graphical program.

23. A computer-implemented method for adding program elements to a program, the method comprising:

displaying the program on a display of a computer system;

displaying a search field on the display, wherein the search field is operable to receive user input;

receiving user input to the search field specifying one or more search criteria;

determining one or more program elements in correspondence with the one or more search criteria;

displaying information indicating the one or more program elements in correspondence with the one or more search criteria;

receiving user input to the search window selecting a program element of the one or more program elements indicated in the search window; and

including the selected program element in the program in response to said receiving user input to the search window selecting the program element.

24. The method of claim 23,

wherein the program is displayed in a first area of the display and the one or more program elements are displayed in a second area of the display;

wherein said including the selected program element in the program comprises receiving user input to drag-and-drop the selected program element from the second area to the first area.

25. The method of claim 23, wherein the program is displayed within a graphical user interface displayed on the display.

26. The method of claim 25,

wherein the program is displayed in a first window of the graphical user interface and the one or more program elements are displayed in a second window of the graphical user interface;

wherein said including the selected program element in the program comprises receiving user input to drag-and-drop the selected program element from the second window to the first window.

27. The method of claim 23, wherein at least one of the one or more program elements includes a graphical user interface program element.

28. The method of claim 23, wherein the program is a graphical program which comprises a plurality of connected nodes that visually indicate functionality of the graphical program.

29. The method of claim 28, wherein at least one of the one or more program elements includes a node which is operable to be interconnected with the plurality of interconnected nodes.

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