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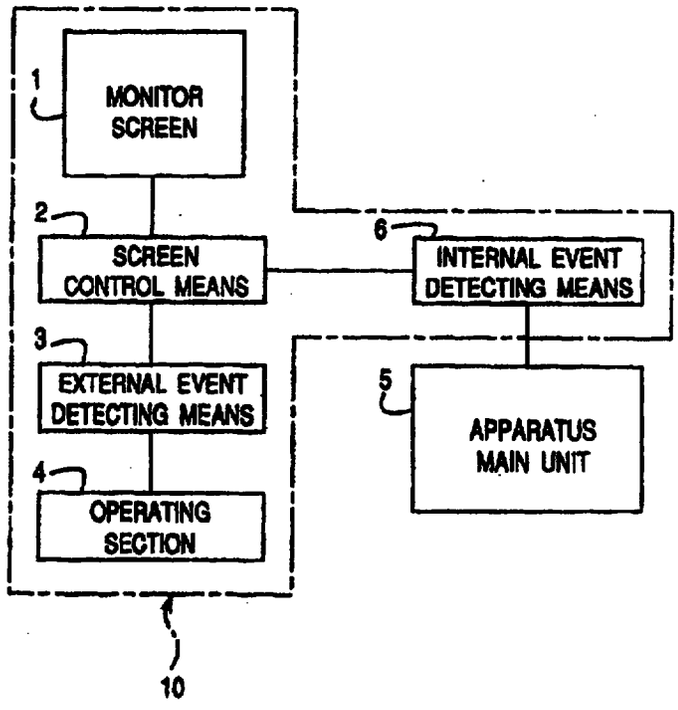
(54) Title: COMPONENT MOUNTING APPARATUS AND METHOD

(57) Abstract

In component mounting method and apparatus, a screen saver function on a monitor screen is canceled upon detection of an event from an operating section or an event from the apparatus, while the screen saver function is executed only when it is truly desired to display nothing on the monitor screen. Thus, it is enabled to maintain the quality of the screen without deteriorating the workability. The order of operation menus on the screen is dynamically rearranged according to the user's selection frequencies so that the menu having the higher frequency is easier to select. With respect to a group of menus on the same hierarchy having a common upper-order menu, the menus preferentially displayed are dynamically reshuffled according to the operational frequencies of the menus. By those means, the optimum arrangement of menus can be maintained according to the state of the apparatus and its operational management by the user. In a data input method, a cursor is moved to an input-waiting position based on a calculated cursor moving direction and the positions of input object candidates, and a cursor moving velocity, even without an input of detailed positional designation.



DESCRIPTION

COMPONENT MOUNTING APPARATUS AND METHOD

TECHNICAL FIELD

The present invention relates to component mounting method and apparatus for mounting components onto members such as boards, and more specifically, relates to screen control method and apparatus used in the component mounting method and apparatus for protecting monitor screens in personal computers and component mounting apparatuses. The present invention also relates to a component mounting method for dynamically customizing operation menus for the electronic component mounting apparatus, and relates to an electronic component mounting apparatus which is provided with the method. The present invention also relates to component mounting method and apparatus which are capable of inputting positional data onto an operating screen of a computer thereof.

BACKGROUND ART

The screen saver function is implemented for the purposes of preventing the burn-in of pixels of the monitor screen and holding the quality of the pixels, by

erasing the image on the monitor screen or by displaying moving graphics and characters on the screen. For component mounting apparatuses, because almost no operations from the monitor screen are executed during the production, the screen saver function is required in particular.

The conventional screen control method is described below with reference to Figs. 4 and 5.

In Fig. 4, reference numeral 11 denotes a monitor screen, 12 denotes screen control means for executing the screen saver function, and 13 denotes external event detecting means for canceling the screen saver function. Reference numeral 14 denotes an operating section for operating the apparatus, and 15 denotes an apparatus main unit.

If no operation is executed by the operating section 14 during a predetermined time period, the screen control means 12 executes the screen saver function on the monitor screen 11 to erase the screen. When a key input from the operating section 14 or a depression of the screen saver function canceling key or the like is effected, the external event detecting means 13, upon detecting it, requests the screen control means 12 to cancel the screen saver function, restoring the screen of the monitor screen 11 to its original state.

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The flow chart of the above action (operation) is shown in Fig. 5. That is, a start time for screen saver is counted at step S81, and then it is decided at step S82 whether or not an external event is occurred. If so, the program returns to step S81. If not, it is decided at step S83 whether or not the counting is arrived at a start time for screen saver. If not, the program returns to step S82. If so, the screen saver is executed at step S84. Then, it is decided at step S85 whether or not an external event is occurred. If so, the screen saver is canceled at step S87 and then, the program returns to step S81. If not at step S85, it is decided at step S86 whether or not the operation of the apparatus is terminated. If not, the program returns to step S85. If so, the program is ended.

However, with the above arrangement, the screen saver function could be canceled only by an input from the operating section 14. As a result, there has been an issue that even when an abnormality has occurred to the apparatus main unit 15, the abnormality could not be known immediately through the monitor screen 11.

Also, depending on the action mode of the apparatus or the contents of work, there are some cases where no operation is effected during a certain time period but the screen monitoring is required. In such a

case, the screen saver function, if activated, needs to be canceled by effecting a key press or other operation each time it occurs. This would result in laborious operation, causing a deterioration of the workability, as another issue.

Conventionally, operation menus have been fixedly configured, based on a function tree defined previously by the manufacturer, in which each menu has been positioned unchanged at all times.

Now referring to the appended drawings, a structure of conventional operation menus mentioned above will be described.

Fig. 11 illustrates an electronic component mounting apparatus which is provided with an operating system. Fig. 12 illustrates an example of the function tree structure of an electronic component mounting apparatus. In Fig. 12, a menu 110 is on an upper-order hierarchy of a menu 111 and of other menus on the same hierarchy as the menu 111, where selecting the menu 110 permits the menu 111 or other menus to be selected. A return to a menu of an upper-order hierarchy from a lower-order hierarchy is done by choosing a particular menu, such as a menu 112, so defined within the lower-order hierarchy. A menu 113 is a special menu which is provided in the case where a large number of menus are on

the same hierarchy. The number of menus that can be displayed simultaneously within one screen is limited by the layout of the operating screen, the hardware configuration of the input device, and the like. Accordingly, when the number of the menus to be arranged on the same hierarchy exceeds this limit due to the function tree structure, the menus are divided into a plurality of groups and special menus for switching among the groups is newly provided to change over the group of menus to be displayed on the screen.

In the operation menus arranged as above, when an objective menu is located at a terminal end of the function tree, the user has to trace the menus one by one from upper-order to lower-order hierarchies, i.e., from broader to narrower terms. Besides, in a selection within each hierarchy, the user has to select a menu pertinent to the purpose of an operation from among a plurality of alternatives with the clue of the menu titles.

Generally, the electronic component mounting apparatus is required to have a large number of functions in controlling the apparatus, managing and editing data with which the apparatus deals, and the like, so that the operation menus are large-scaled and complicated. Accordingly, to quickly know the location of a menu that

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the user aims is one of the important factors that directly affect the apparatus productivity. In the conventional arrangement described above, however, the menus are fixedly positioned, and therefore, when a menu with a lower operational frequency is arranged in a higher order than a menu with a higher operational frequency depending on the structure of the function tree, each menu selection requires an additional procedure for seeking the intended menu from an upper-order position to a lower-order position, resulting in poor operability as an issue.

Moreover, in an operation menu structure where a large number of menus are on the same hierarchy like the menu 13, the menus even on the same hierarchy have to be divided into the upper-order hierarchy and the low-order hierarchy consequently. Thus, in this structure, the number of procedures required for selecting a menu on the low-order hierarchy is necessarily one greater than the number of procedures required for selecting a menu on the upper-order hierarchy. This would result in further complicated structure of operation menus as another issue.

A characteristic of the operation of electronic component mounting apparatus is that the frequency of use of a menu varies dynamically because different menus are

used depending on the operated conditions of the apparatus, such as those in which the apparatus is under production, under a changeover of product items, and under maintenance. For example, it is expected that whereas the production management information concerning product items is frequently referred to under production, the reference to data such as reference to and setting of apparatus data is more frequent than the reference to the production management information during maintenance. In many cases, actually, an operation involving a plurality of menus is required, such as when data reference is made under the production, and the menus are repetitively used by turns, so that those menus involved are necessarily selected more frequently than the other menus. In the case where such menus of higher selectional frequency are consequently arranged in lower orders than menus of lower selectional frequency, the result would be such that increased procedures are required for menu selection by the user.

The operational frequency of a menu also depends on the way in which the user runs the apparatus. Some users runs the apparatus in the way that operations such as the input and output of data and the editing of data are collectively assigned to the host while only the setting of apparatus data is the main part of the

operations using the operation menus of the apparatus. Accordingly, it is difficult to arrange the fixed operation menus provided by the manufacturer so that the ways in which all the users run the apparatus are satisfied.

On the other hand, conventionally, in designating a position on an operating screen of a computer by using an input device such as a mouse, track ball or joy stick, a cursor is moved to the objective position, as shown in Fig. 23, by manipulating the mouse or the like. Otherwise, as shown in Fig. 24, the cursor is automatically moved to a default position inputted previously.

The conventional input methods, however, have had some issues. For example, it would take much time for an operator who is not accustomed to manipulate the mouse or track ball, to move the cursor to the objective position, and such an operator would fail to move the cursor to the objective position just as he or she wants. In some cases, the operation by a keyboard would be rather faster, so that the operator would use both the input device, such as a mouse, and the keyboard, resulting in complicated operation.

DISCLOSURE OF THE INVENTION

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Accordingly, an object of the present invention is to provide component mounting method and apparatus in which a screen saver function is automatically canceled as it is necessary, for example when an abnormality has occurred to its apparatus main unit or when an action mode needs monitoring. An object of the present invention is also to provide component mounting method and apparatus in which operation menus are customized optimally for a user by dynamically changing over the operation menus. An object of the present invention is to provide method and apparatus for moving a cursor to an objective position without designating the position in detail with an input device such as a mouse or track ball.

In accomplishing these and other aspects, according to a first aspect of the present invention, there is provided a component mounting method for executing an operation by an operating section through a monitor screen in which a screen control method is used,

the screen control method comprising steps of:

executing a screen saver function on the monitor screen when no operation is effected on the operating section during a preset time period; and

canceling the screen saver function when an event from the operating section is detected or when an

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event from the apparatus other than the operating section is detected.

According to a second aspect of the present invention, there is provided the component mounting method as defined in the first aspect, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in executing the component mounting method.

According to a third aspect of the present invention, there is provided the component mounting method as defined in the first aspect, wherein in the screen saver function executing step, the screen saver function on the monitor screen is not executed in accordance with an operational mode of the component mounting method.

According to a fourth aspect of the present invention, there is provided a component mounting apparatus comprising a screen control apparatus,

the screen control apparatus comprising:

a monitor screen;

an operating section for executing an operation through the monitor screen;

a screen control means for executing a screen saver function on the monitor screen;

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an external event detecting means for canceling the screen saver function upon detection of an event derived from the operating section; and

an internal event detecting means for canceling the screen saver function upon detection of an event derived from the apparatus other than the operating section.

According to a fifth aspect of the present invention, there is provided the component mounting apparatus as defined in the fourth aspect, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in the apparatus.

According to a sixth aspect of the present invention, there is provided the component mounting apparatus as defined in the fourth aspect, wherein the screen control means does not execute the screen saver function on the monitor screen in accordance with an operational mode of the component mounting apparatus.

With the arrangement, the screen control method and apparatus allow the screen saver function to be executed only when it is truly desired to display nothing on the monitor screen, by which the quality of the monitor screen is maintained.

Further, the screen saver function can be canceled upon detection of an error or a warning caused in the apparatus or executing the method as an internal event, so that abnormality can be known immediately by viewing the monitor screen.

Further, since the screen saver function is not executed on the monitor screen in accordance with an operational mode of the component mounting apparatus or method, the monitor screen can be monitored even if no operation is effected during a certain time period, in accordance with the operational mode.

According to a seventh aspect of the present invention, there is provided the component mounting method as defined in the first aspect, comprising a method for customizing operation menus of an electronic component mounting apparatus comprising a screen for displaying operation menus of an electronic component mounting apparatus to a user,

the method comprising steps of:

selecting an operation menu out of the operation menus;

dynamically rearranging an order in which the operation menus are displayed on the screen, according to frequencies of selection of the operation menus by the user so that an operation menu having the higher

frequency of selection is moved to a position that is easier to select.

According to an eighth aspect of the present invention, there is provided the component mounting method, as defined in the first aspect, comprising a method for customizing operation menus of an electronic component mounting apparatus,

the method comprising steps of:

selecting an operation menu out of the operation menus;

dynamically reshuffling, when a number of operation menus contained in a menu group of a same hierarchy which belongs to a common upper-order operation menu exceeds a maximum number of operation menus that can be displayed within a screen, groups of the operation menus according to operational frequencies of the menus so that operation menus having relatively high operational frequencies are included in a group of operation menus that is first displayed, and are thereby preferentially displayed.

According to a ninth aspect of the present invention, there is provided the electronic component mounting apparatus as defined in the fourth aspect, wherein the apparatus customizes the operation menus of the apparatus,

the apparatus further comprising an input device for selecting an operation menu out of the operation menus,

wherein the screen displays the operation menus, and the screen control means dynamically rearranges an order in which the operation menus are displayed on the screen, according to frequencies of selection of the operation menus so that an operation menu having the higher frequency of selection is moved to a position that is easier to select.

According to a tenth aspect of the present invention, there is provided the component mounting apparatus as defined in the fourth aspect, wherein the apparatus customizes the operation menus of the apparatus,

the apparatus further comprising an input device for selecting an operation menu out of the operation menus,

wherein the screen displays the operation menus, and the screen control means dynamically reshuffles, when a number of operation menus contained in a menu group of a same hierarchy which belongs to a common upper-order operation menu exceeds a maximum number of operation menus that can be displayed within the screen, groups of the operation menus according to operational frequencies of the menus so that operation menus having relatively high operational frequencies are included in a group of

operation menus that is first displayed, and are thereby preferentially displayed.

With the method and apparatus of the seventh through tenth aspects arranged as above for customizing menus according to the operational frequency, the operational frequency of the user can be obtained, for example, from an input device with which the user selects the menu out of the operation menus of the electronic component mounting apparatus, and an order in which the operation menus are displayed on the screen is dynamically rearranged according to frequencies of selection of the operation menus by the user so that an operation menu having the higher frequency of selection is moved to a position that is the easier to select.

According to an eleventh aspect of the present invention, there is provided the component mounting method as defined in the first aspect, comprising a data input method for a computer using an input device,

the method comprising steps of:

in a process of repositioning an input cursor for designation of a position, storing a current cursor position and a cursor position inputted from the input device;

calculating a cursor moving direction based on both the current cursor position and the cursor position; and

moving the cursor to an input-waiting position based on the calculated cursor moving direction and positions of input object candidates, even without an input of detailed positional designation.

According to a twelfth aspect of the present invention, there is provided the component mounting method as defined in the eleventh aspect, further comprising a step of storing a cursor moving velocity in addition to the cursor moving direction calculated from the current cursor position and the inputted cursor position, wherein the cursor is moved to the input-waiting position based on the calculated cursor moving direction, the cursor moving velocity, and the positions of input object candidates even without an input of detailed positional designation.

According to a thirteenth aspect of the present invention, there is provided the component mounting apparatus as defined in the fourth aspect, further comprising:

a current position storing means for storing a current cursor position;

an inputted position storing means for storing a cursor position inputted from an input device;

a moving direction calculating means for calculating a cursor moving direction based on both the current cursor position and the inputted cursor position;

an input object storing means for storing positions of input object candidates; and

a corrected position determining means for moving the cursor to an objective position which an operator purposes, based on the calculated cursor moving direction and the positions of input object candidates.

According to a fourteenth aspect of the present invention, there is provided the component mounting apparatus as claimed in the thirteenth aspect, further comprising: a cursor moving amount differential calculating means for calculating a cursor moving velocity,

wherein the corrected position determining means moves the cursor to the objective position which the operator purposes, based on the calculated cursor moving direction, the cursor moving velocity, and the positions of input object candidates.

With the above arrangements of the eleventh through fourteenth aspects, in positioning the input cursor for designation of a position by data input using

the input device such as a mouse or track ball in computer operation, the cursor can be moved to the objective position by a rough input of cursor position even without an input of detailed positional designation.

BRIEF DESCRIPTION OF DRAWINGS

These and other aspects and features of the present invention will become clear from the following description taken in conjunction with the preferred embodiments thereof with reference to the accompanying drawings, in which:

Fig. 1 is a block diagram showing the arrangement of the screen control section in component mounting method and apparatus according to a first embodiment of the present invention to which a screen control method is applied;

Fig. 2 is a flow chart of the screen control method of the first embodiment;

Fig. 3 is a flow chart of a the screen control method in component mounting method and apparatus according to a second embodiment of the present invention;

Fig. 4 is a block diagram showing the arrangement of the conventional screen control section;

Fig. 5 is a flow chart of the screen control method of Fig. 4;

Fig. 6 is an appearance view of an operating system of a third embodiment of the present invention;

Fig. 7 is a flow chart illustrating the processing procedure of the third embodiment;

Fig. 8 illustrates an operating screen of an embodiment of the third embodiment;

Fig. 9 is a chart illustrating operational frequencies in the third embodiment;

Fig. 10 illustrates a function tree structure of a fourth embodiment of the present invention, in the case where the number of the menus on the same hierarchy which have a common upper-order menu exceeds the maximum number of menus that can be displayed on a screen;

Fig. 11 is an appearance view of an electronic component mounting apparatus to which the third and/or fourth embodiments are applied;

Fig. 12 illustrates an example of a function tree structure of a conventional electronic component mounting apparatus;

Fig. 13 is a flow chart showing an example of the fourth embodiment;

Fig. 14 is a view showing a tree structure of an initial setting state of the menu screen immediately after the apparatus is turned on;

Fig. 15 is a view showing a tree structure during operation before a menu is exchanged;

Fig. 16 is a view showing a tree structure after a menu is exchanged;

Fig. 17 is a system arrangement view of a fifth embodiment of the present invention;

Fig. 18 is a flow chart of the operation in the fifth embodiment;

Figs. 19A, 19B, and 19C are explanatory views showing the operation of the fifth embodiment of the invention;

Figs. 20A, 20B, 20C, and 20D are other explanatory views showing the operation of the fifth embodiment of the invention;

Fig. 21 is a system arrangement view of a sixth embodiment of the invention;

Fig. 22 is a flow chart of the operation in the sixth embodiment of the invention;

Fig. 23 is an explanatory view showing the operation in a conventional method; and

Fig. 24 is another explanatory view showing the operation of the conventional method.

BEST MODE FOR CARRYING OUT THE INVENTION

Before the description of the present invention proceeds, it is to be noted that like parts are designated by like reference numerals throughout the accompanying drawings.

Hereinbelow, an embodiment of the screen control apparatus according to the present invention is described with reference to Figs. 1 and 2.

In Fig. 1, reference numeral 1 denotes a monitor screen, 2 denotes screen control means for executing the screen saver function, and 3 denotes external event detecting means for canceling the screen saver function. Reference numeral 4 denotes an operating section for operating a component mounting apparatus, and 5 denotes an apparatus main unit of the component mounting apparatus. Reference numeral 6 denotes internal event detecting means for canceling the screen saver function upon detection of an event from the apparatus main unit 5.

The action (operation) with the above arrangement is explained with reference to the flow chart of Fig. 2. That is, a start time for screen saver is counted at step S1, and then it is decided at step S2 whether or not an external event is occurred. If so, the program returns to step S1. If not, it is decided at

step S3 whether or not an internal event is occurred. If so, the program returns to step S1. If not, it is decided at step S4 whether or not the counting is arrived at a start time for screen saver. If not, the program returns to step S2. If so, the screen saver is executed at step S5. Then, it is decided at step S6 whether or not an external event is occurred. If so, the screen saver is canceled at step S9 and then, the program returns to step S1. If not at step S6, it is decided at step S7 whether or not an internal event is occurred. If so, the screen saver is canceled at step S9 and then, the program returns to step S1. If not at step S7, it is decided at step S8 whether or not the operation of the apparatus is terminated. If not, the program returns to step S86. If so, the program is ended. When no operation is effected during a predetermined time period and no internal event such as an error message from the apparatus main unit 5 occurs, the screen is erased by executing the screen saver function on the monitor screen 1 from the screen control means 2 at steps S1-S5.

Upon a key input from the operating section 4 or a depression of the screen saver function canceling key or the like, the external event detecting means 3 requests the screen control means 2 to cancel the screen

saver function, restoring the screen of the monitor screen 1 to the original state at steps S6 and S9.

Also, upon an event such as an error message from the apparatus main unit 5, the internal event detecting means 6 requests the screen control means 2 to cancel the screen saver function, restoring the screen of the monitor screen 1 to the original state at steps S7 and S9.

With the above action, the screen saver function is automatically canceled when the operation of the apparatus or the monitoring of the action is necessary, whereas the screen saver function is executed only when the monitor screen is unnecessary. Thus, the monitor screen 1 can be prevented from burn-in of pixels without deteriorating the workability, so that the quality can be maintained.

Although the screen saver function in the above embodiment has been shown as a method of erasing the screen, it is also possible to display moving graphics or characters on the screen.

Next, a second embodiment of the present invention is described with reference to Figs. 1 and 3. The apparatus main unit 5 of an electronic component mounting apparatus is so designed as to be able to designate, as its mounting action, a one-block action

mode, that is, action adjustment mode, that the action is executed step by step from a component suction action for sucking and holding a component from a component supply section to a component mounting action for mounting the sucked component onto a board for action adjustment, and a continuous action mode, that is, normal action mode, that the action is executed continuously from a component suction action for sucking and holding components from component supply sections to a component mounting action for mounting the sucked components onto boards for continuous production. In the one-block action mode out of these two action modes, the operator operates the mounting apparatus while checking the mounting state in sequence.

In this case, because the operation is not necessarily effected at all times, the screen saver function, when in effect, may be an obstacle to the mounting state checking work. Meanwhile, in the continuous action mode, because the production of electronic component mounting is normally carried out without effecting any operation on the component mounting apparatus, it is not necessary to hold the screen display normally.

The screen control means 2 checks the two action modes at step S10 in Fig. 3, where the screen

control means 2 controls in such a way that the screen saver function is nullified for the one-block action mode at step 10, and that the screen saver function is validated for the continuous action mode at steps S10 and S11-S19 which are similar to steps S1-S9 in Fig. 2.

While the operator is operating the component mounting apparatus with the above settings, the screen saver function will not be executed even with an elapse of a predetermined time in the case of the one-block action mode, so that the screen of the monitor screen 1 will not be erased.

As described above, the screen saver function is executed only when it is truly required, by which the operability of the electronic component mounting apparatus can be enhanced.

The above embodiment has been described in the case of one-block action and continuous action modes. However, the present invention may be applied to other actions or modes that the component mounting apparatus has.

According to the screen control method and apparatus in the component mounting method and apparatus of the present invention, as apparent from the above description, when an event from the operating section is detected and/or when an event from the apparatus other

than the operating section is detected, the screen saver function is canceled. Therefore, it becomes possible to execute the screen saver function only when it is truly desired to display nothing on the monitor screen, without obstructing the operation of the apparatus or the monitoring of the action. Thus, the burn-in of pixels of the monitor screen can be prevented, and the quality of the monitor screen can be maintained without deteriorating the workability.

Also, the component mounting apparatus is provided with a screen control apparatus comprising internal event detecting means for canceling the screen saver function upon detection of an error or warning as an internal event. With this arrangement, upon eruption of an error or warning, the abnormality can immediately be known by viewing the monitor screen.

Also, the component mounting apparatus is provided with a screen control apparatus comprising screen control means for executing the screen saver function on the monitor screen depending on the action mode of the component mounting apparatus. With this arrangement, the monitor screen can be monitored even if no operation is effected during a certain time period, depending on the action mode of the apparatus or the contents of the work.

Although the screen saver function on the monitor screen is not executed in the action adjustment mode in the second embodiment, the screen saver function on the monitor screen is, in generally, not executed in accordance with an operational mode of the component mounting method/apparatus, such as a non-screen saver mode of the component mounting method/apparatus. The action adjustment mode of the component mounting method is one example of the non-screen saver mode.

Referring to the drawings, a third embodiment of the invention will be described below.

Fig. 6 is an appearance view of an operating system of the third embodiment; Fig. 7 is a flow chart illustrating the processing procedure of the third embodiment; Fig. 8 illustrates an operating screen of the third embodiment; and Fig. 9 is a chart illustrating the operational frequencies which are defined with respect to the menus in Fig. 8. In Fig. 6, reference numeral 101 designates a screen display unit and numeral 102 designates a device for selecting and inputting a menu displayed on the screen display unit 101. In this case, a track ball, a type of pointing device, is employed as the device 102. Fig. 8 illustrates an operating screen displayed on the screen display unit 101, and reference numerals 103, 104, 105, 106, 107, and 108 respectively

designate a menu which can be selected. During the selection, a menu is switched over to another menu with the track ball 102.

Referring to Figs. 7, 8, and 9, the action of the operating system arranged as above will be described below.

Initially, a menu selected out of the menus on the same hierarchy which are displayed as shown in Fig. 8 is inputted with the track ball 102. Each menu has the number of times of being selected, i.e. the operational frequency, as its attribute. When a menu is selected at step S51 of Fig. 7, one is added to the operational frequency of the menu at step S52. In Fig. 9, the operational frequencies which are defined with respect to the menus on the same hierarchy are illustrated. In the case that the selected menu has no menus on the lower-order hierarchies at step S53, the function is executed at step S55. In the case that the selected menu has any menus on the lower-order hierarchies at step S53, menus are displayed according to the operational frequencies which the lower-order hierarchy menus have at step S54.

The operational frequencies are compared among a group of menus on the same hierarchy which have the same upper-order menu. A menu which has been selected a greater number of times out of the menu group is defined

as having a higher operational frequency, and a menu which has been selected a smaller number of times is defined as having a lower operational frequency. In Fig. 8, it is assumed that a position on the left side of the screen is easier to select. The menus are displayed on the screen from left to right in descending order of operational frequency, based on the latest operational frequencies at all times.

The number of times of selection of a menu assumes a finite value; however, too large a value makes the comparison among the menus meaningless. Therefore, at a timing set arbitrarily by the user (e.g., turning-off of the power of the apparatus, change of the operator etc.), the order of the menus which depend on their operational frequencies at the time point is taken as a basis, and the numbers of times of selection are cleared.

With the third embodiment, as described above, menus 103, 104, 105, 106, 107, and 108 are displayed on the screen from left to right in descending order of operational frequency at all times. Thus, the more highly a menu is expected to be selected at the time of the selection, the nearer to the leftmost position the menu is located.

Referring to the drawings, a fourth embodiment of the invention will be described below.

Fig. 10 illustrates a function tree structure in the case where the number of the menus on the same hierarchy which have a common upper-order menu exceeds the maximum number of menus that can be displayed on a screen. In Fig. 10, a menu 109 is an exclusive menu for switching over the menus initially displayed to the menus displayed next. Comparing the structure with the conventional function tree structure shown in Fig. 12, in the conventional structure which has a great number of operation menus on the same hierarchy as shown in Fig. 12, the menus to be even on the same hierarchy are divided into a group on the upper-order hierarchy and a group on the low-order hierarchy as shown in the menu 13, and each group of menus has fixed members. In the third embodiment, on the contrary, the menus are considered to be on the same hierarchy, and the operational frequency of the same level is applied to the menus, so that which group a menu belongs to in Fig. 10 changes dynamically. That is, the menus are repositioned so that a menu which has the higher operational frequency is included into the group of menus displayed initially and that a menu which has the lower operational frequency is included into the group of menus displayed next.

Next, in order to clearly describe the fourth embodiment, an example will be described with reference to Figs. 13 through 16.

In Fig. 13, an initial frequency value F(n) of each menu is set to be 1 at step S21 and it is assumed that any threshold value S is set to be 5. Then, each time the operation is selected and carried out, 1 is added to the operational frequency of the selected operation at step S22. Then, it is decided at step S23 whether or not F(MAX(B)) - F(MAX(A)) > S. If no, the program returns to step S22. If so, the menu N2 of the MAX(B) in the menu group B is exchanged with the menu N1 of MIN(A) in the menu group A and they are displayed in the screen. Then, the menu N1 of MIN(A) which was in the menu group A is added into the menu group B whereas the menu N2 of MAX(B) which was in the menu group B is added into the menu group A at step S25 and then, the program returns to step S22. Here, MIN(A) indicates a menu having the minimum operational frequency in the menu group A. MAX(B) indicates a menu having the maximum operational frequency in the menu group B. F(MIN(A)) indicates an operational frequency value of the menu having the minimum operational frequency in the menu group A. F(MAX(B)) indicates an operational frequency

value of the menu having the maximum operational frequency in the menu group B.

This action is shown in Figs. 14-16 as a more specific example, Fig. 14 shows a tree structure of an initial setting state of the menu screen immediately after the apparatus is turned on. An operational frequency of each menu is set to be 0. The menu group A at the first hierarchy includes LOAD, SAVE, DELETE, COPY, RENAME, PRINT, and DATA CONVERT. The menu group B at the second hierarchy includes FORMAT FD and SAVE IMAGE. In Fig. 14, when the operation of FORMAT FD is carried out, the menu of FORMAT FD can be displayed and selected after a menu of GO TO NEXT/GO BACKWARD is selected. Fig. 15 shows the screen after some operations are selected and carried out. The operational frequencies of the carried-out operations are indicated in the figure by dotted frames which are not viewed in the actual screen. The operational frequencies are increased each time the operation is carried out at step S22. In Fig. 14, MIN(A) indicating a menu having the minimum operational frequency in the menu group A is DATA CONVERT. MAX(B) indicating a menu having the maximum operational frequency in the menu group B is FORMAT FD. F(MIN(A)) indicating an operational frequency value of the menu having the minimum operational frequency in the menu

group A is 2. F(MAX(B)) indicating an operational frequency value of the menu having the maximum operational frequency in the menu group B is 8. According to the operation at step S23, {F(MAX(B)) - F(MAX(A)) > S} = 8-2 = 6 > 5. Then, as shown in Figs. 15 and 15, the menu of DATA CONVERT which was in the menu group A is exchanged with the menu of FORMAT FD which was in the menu group B, and then the menu of DATA CONVERT is added in the menu group B whereas the menu of FORMAT FD is added in the menu group A. Thus, in Fig. 16, when the operation of FORMAT FD is carried out, the menu of FORMAT FD can be already displayed and easily selected without selecting the menu of GO TO NEXT/GO BACKWARD.

The method according to the third and fourth embodiments can carried out by the screen control means in Fig. 1 as an example.

According to the fourth embodiment, as described above, the menus which have higher operational frequencies are preferentially displayed so that a menu can be selected without considering the difference between the broader term and the narrower term.

As described above, the method of the invention for customizing operation menus of an electronic component mounting apparatus comprises a screen for displaying operation menus of the electronic component

mounting apparatus to a user and an input means or input device for selecting an operation menu out of the operation menus, wherein an order in which the operation menus are displayed on the screen is dynamically rearranged according to frequencies of selection of the operation menus by the user so that an operation menu having the higher frequency of selection is moved to a position that is the easier to select. Besides, with respect to a group of menus on the same hierarchy which have a common upper-order menu, groups of menus which are preferentially displayed are dynamically reshuffled according to the number of menus that are displayed on a screen and according to the operational frequencies. By those means, the optimum arrangement of menus is maintained according to the state of the electronic component mounting apparatus and its operational management by the user. Thus, the menu purposed by the user can be found out and selected quickly out of a large number of intricate operation menus of the apparatus, by which the operability is improved.

In addition, because the operation menus which are based on the function tree provided by the manufacturer have a structure which is supposed to be customized, the operation menus can be flexibly adapted to additional new functions, special functions for

individual users, or the like, by which the extensibility and maintainability as a apparatus are improved.

Referring to the drawings, a fifth embodiment of the invention will be described below.

Fig. 17 is a system arrangement view of a data input method showing the fifth embodiment of the invention.

Fig. 18 is a flow chart illustrating the operation in the system arrangement of Fig. 17. Referring to Fig. 17, a current position storing means 211 stores the current cursor position at step S61, and an inputted position storing means 212 stores the cursor position inputted from an input device such as a mouse or a track ball 102 in Fig. 6 by an operator at step S63. A moving direction calculating means 213 calculates a cursor moving direction based on the current cursor position and the inputted cursor position at step S66. An input object storing means 214 stores positions of input object candidates at step S62. A corrected position determining means 215 moves the cursor to the objective position, e.g. input-waiting position, which the operator purposes, based on the calculated cursor moving direction and the positions of input object candidates at step S65.

With respect to the data input method having the above arrangement, its action is described below.

It is assumed that, as shown in Figs. 19A to 19C, there are three candidates, BUTTON A, BUTTON B, and BUTTON C, for position input to be made with the mouse, and that the current mouse cursor position is an arbitrary position. It is also assumed that each position has its coordinates as shown in the figures. The current position is stored at step S61 and the candidates for movement are stored at step S62. Assume that the operator initially moves the mouse cursor to the position shown in Fig. 19B by manipulating the mouse, where the cursor moving operation in this case is done not precisely but so roughly as to designate an approximate direction. So, the inputted position is accepted at step S63. Then, at step S64, the system calculates the cursor moving direction based on the current cursor position and the inputted cursor position. This is done by a linear equation determined from two points, $y = ax + b$, where "a" and "b" are constants.

On the other hand, each of the three candidates for position input is assumed to have an area with an arbitrary width, as shown by dotted lines in Fig. 19C.

With the above information, it is checked whether the position of inputted coordinates belong to

any one of the areas of the three candidates for position input at step S64. If the coordinates belong to any one of the areas, the cursor is moved to reference coordinates of the objective candidate at step S65. If the coordinates belong to none of the areas, the area nearest to the linear equation, $y = ax + b$, of the three candidate areas for position input is found out at step S66, and then, the cursor is moved to the reference coordinates of the candidate found out at step S65.

In this process, the nearest position may be found out either by varying the constant b of the linear equation or by varying the constant a of the equation.

Next, it is assumed that, as shown in Figs. 20A to 20D, there are six candidates, BUTTON A, BUTTON B, BUTTON C, BUTTON D, BUTTON E, and BUTTON F, for position input to be made by the mouse, and that each position has its coordinates as shown in the figures. Now assume that the operator has moved the mouse cursor to the position shown in Fig. 20B by manipulating the mouse, where the cursor moving operation in this case is done not precisely but so roughly as to designate an approximate direction. The system calculates the cursor move direction based on the current cursor position and the inputted cursor position. This is done by a linear

equation determined from two points, $y = ax + b$, where "a" and "b" are constants.

On the other hand, each of the six candidates for position input is assumed to have an area with an arbitrary width, as shown by dotted lines in Fig. 20C.

With the above information, it is checked whether the position of the inputted coordinates belong to any one of the areas of the six candidates for position at step S64. If the coordinates belong to any one of the areas, the cursor is moved to reference coordinates of the objective candidate at S65.

If the coordinates belong to none of the areas at step S64, the area nearest to the linear equation, $y = ax + b$, of the six candidate areas for position input is found out at step S66, and then, the cursor is moved to the reference coordinates of the candidate found out at step S65. In this process, if a plurality of areas have been found out as the object, the cursor is moved to reference coordinates of the candidate nearest to the position of the inputted coordinates or the candidate nearest to the position of the coordinates where the cursor has resided initially.

Next, a sixth embodiment of the invention is described with reference to Figs. 21 to 24.

Fig. 21 is a block diagram showing the arrangement of the sixth embodiment of the present invention. Referring to Fig. 21, the current position storing means 211 stores the current cursor position. The inputted position storing means 212 stores the cursor position inputted from an input device such as a mouse by an operator. The move direction calculating means 213 calculates a cursor moving direction based on the current cursor position and the inputted cursor position. A cursor moving amount differential calculating means 221 calculates a cursor moving velocity. The input object storing means 214 stores positions of input object candidates. The corrected position determining means 215 moves the cursor to the objective position which the operator purposes, based on the calculated cursor moving direction and the positions of the input object candidates.

With respect to the data input method having the above arrangement, its operation is described below.

Fig. 22 is a flow chart of the operation in the arrangement of Fig. 21.

It is assumed that, as shown in Figs. 20A-20D, there are six candidates for position input to be made with the mouse, and that each position has its coordinates as shown in the figures. The current

position is stored at step S71 and the candidates for movement are stored at step S72. It is also assumed that the operator has moved the mouse cursor to the position shown in Fig. 20B by manipulating the mouse, where the cursor moving operation is done not precisely but so roughly as to designate an approximate direction. So, the inputted position is stored at step S73. Then, at step S74, the system calculates the cursor moving direction based on the current cursor position and the inputted position. This is done by a linear equation determined from two points, $y = ax + b$, where "a" and "b" are constants. Simultaneously, the system calculates the cursor moving velocity by measuring the time which has passed since the beginning of the move of the cursor till a stop of the cursor.

In this process, the nearest position may be found out either by varying the constant b of the linear equation or by varying the constant a of the equation.

On the other hand, each of the six candidates for position input is assumed to have an area with an arbitrary width, as shown by the dotted lines in Fig. 20C.

With the above information, it is checked at step S74 whether the position of inputted coordinates belong to any one of the areas of the six candidates for

position. If the coordinates belong to any one of the areas, the cursor is moved to reference coordinates of the objective candidate at step S75.

If the coordinates belong to none of the areas, the area nearest to the linear equation, $y = ax + b$, of the six candidate areas for position input is found out at steps S76 and S77, and then, the cursor is moved to the reference coordinates of the candidate found out at step S75. For cases where a plurality of areas have been found out as the object, cursor moving velocity is previously classified into several levels, and the cursor is moved to the position of a candidate which is determined as the object according to the level of the moving velocity. Now assume that there are three levels of moving velocity and that the cursor moving velocity is S1 corresponding to velocity level 1 (the highest velocity level). In this case, because of the high cursor move velocity, the system judges that the operator purposes the candidate that is the farther from the position of the initial coordinates, and moves the cursor to the position of the reference coordinates of BUTTON D shown in Fig. 20D. When the cursor move velocity S1 is at the velocity level 2 (medium velocity level), the system similarly moves the cursor to the position of the reference coordinates of BUTTON D. Only when the cursor

move velocity S1 is at the velocity level 3 (the lowest velocity level), the system chooses the candidate that is the nearer to the position of the initial coordinates, and moves the cursor to the position of the candidate of BUTTON B.

In the above sixth embodiment, although the moving velocity has been classified into three levels, the velocity may be classified into an arbitrary number of levels. Also, for each level of the velocity, the system may choose either the candidate nearer to the position of the initial coordinates or the candidate farther from the position of the initial coordinates, whichever it is, optically.

According to the invention, as described above, in repositioning the input cursor for designation of a position by data input with an input device such as a mouse or track ball in computer operation, the cursor can be easily moved to the objective position only by a rough input of cursor position even without an input of detailed positional designation.

Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such changes and

modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

CLAIMS

1. A component mounting method for executing an operation by an operating section (4) through a monitor screen (1) in which a screen control method is used,

the screen control method comprising steps of:

executing a screen saver function on the monitor screen when no operation is effected on the operating section during a preset time period; and

canceling the screen saver function when an event from the operating section is detected or when an event from the apparatus other than the operating section is detected.

2. The component mounting method as defined in claim 1, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in executing the component mounting method.

3. The component mounting method as defined in claim 1, wherein in the screen saver function executing step, the screen saver function on the monitor screen is not executed in accordance with an operational mode of the component mounting method.

4. A component mounting apparatus comprising a screen control apparatus,

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THIS SHEET HAS BEEN REPLACED

the screen control apparatus comprising:

a monitor screen (1);

an operating section (4) for executing an operation through the monitor screen;

a screen control means (2) for executing a screen saver function on the monitor screen;

an external event detecting means (3) for canceling the screen saver function upon detection of an event derived from the operating section; and

an internal event detecting means (6) for canceling the screen saver function upon detection of an event derived from the apparatus other than the operating section.

5. The component mounting apparatus as defined in claim 4, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in the apparatus.

6. The component mounting apparatus as defined in claim 4, wherein the screen control means does not execute the screen saver function on the monitor screen in accordance with an operational mode of the component mounting apparatus.

7. The component mounting method as defined in claim 1, comprising a method for customizing operation menus of an electronic component mounting apparatus

comprising a screen for displaying operation menus of an electronic component mounting apparatus to a user,

the method comprising steps of:

selecting an operation menu out of the operation menus;

dynamically rearranging an order in which the operation menus are displayed on the screen, according to frequencies of selection of the operation menus by the user so that an operation menu having the higher frequency of selection is moved to a position that is easier to select.

8. The component mounting method, as defined in claim 1, comprising a method for customizing operation menus of an electronic component mounting apparatus,

the method comprising steps of:

selecting an operation menu out of the operation menus;

dynamically reshuffling, when a number of operation menus contained in a menu group of a same hierarchy which belongs to a common upper-order operation menu exceeds a maximum number of operation menus that can be displayed within a screen, groups of the operation menus according to operational frequencies of the menus so that operation menus having relatively high operational frequencies are included in a group of

operation menus that is first displayed, and are thereby preferentially displayed.

9. The electronic component mounting apparatus as defined in claim 4, wherein the apparatus customizes the operation menus of the apparatus,

the apparatus further comprising an input device (102) for selecting an operation menu out of the operation menus,

wherein the screen (101) displays the operation menus, and the screen control means dynamically rearranges an order in which the operation menus are displayed on the screen, according to frequencies of selection of the operation menus so that an operation menu having the higher frequency of selection is moved to a position that is easier to select.

10. The component mounting apparatus as defined in claim 4, wherein the apparatus customizes the operation menus of the apparatus,

the apparatus further comprising an input device (102) for selecting an operation menu out of the operation menus,

wherein the screen (101) displays the operation menus, and the screen control means dynamically reshuffles, when a number of operation menus contained in a menu group of a same hierarchy which belongs to a

common upper-order operation menu exceeds a maximum number of operation menus that can be displayed within the screen, groups of the operation menus according to operational frequencies of the menus so that operation menus having relatively high operational frequencies are included in a group of operation menus that is first displayed, and are thereby preferentially displayed.

11. The component mounting method as defined in claim 1, comprising a data input method for a computer using an input device,

the method comprising steps of:

in a process of repositioning an input cursor for designation of a position, storing a current cursor position and a cursor position inputted from the input device;

calculating a cursor moving direction based on both the current cursor position and the cursor position; and

moving the cursor to an input-waiting position based on the calculated cursor moving direction and positions of input object candidates, even without an input of detailed positional designation.

12. The component mounting method as defined in claim 11, further comprising a step of storing a cursor moving velocity in addition to the cursor moving

direction calculated from the current cursor position and the inputted cursor position, wherein the cursor is moved to the input-waiting position based on the calculated cursor moving direction, the cursor moving velocity, and the positions of input object candidates even without an input of detailed positional designation.

13. The component mounting apparatus as defined in claim 4, further comprising:

a current position storing means (211) for storing a current cursor position;

an inputted position storing means (212) for storing a cursor position inputted from an input device;

a moving direction calculating means (213) for calculating a cursor moving direction based on both the current cursor position and the inputted cursor position;

an input object storing means (214) for storing positions of input object candidates; and

a corrected position determining means (215) for moving the cursor to an objective position which an operator purposes, based on the calculated cursor moving direction and the positions of input object candidates.

14. The component mounting apparatus as claimed in claim 13, further comprising: a cursor moving amount differential calculating means (221) for calculating a cursor moving velocity,

wherein the corrected position determining means (215) moves the cursor to the objective position which the operator purposes, based on the calculated cursor moving direction, the cursor moving velocity, and the positions of input object candidates.

Fig. 1

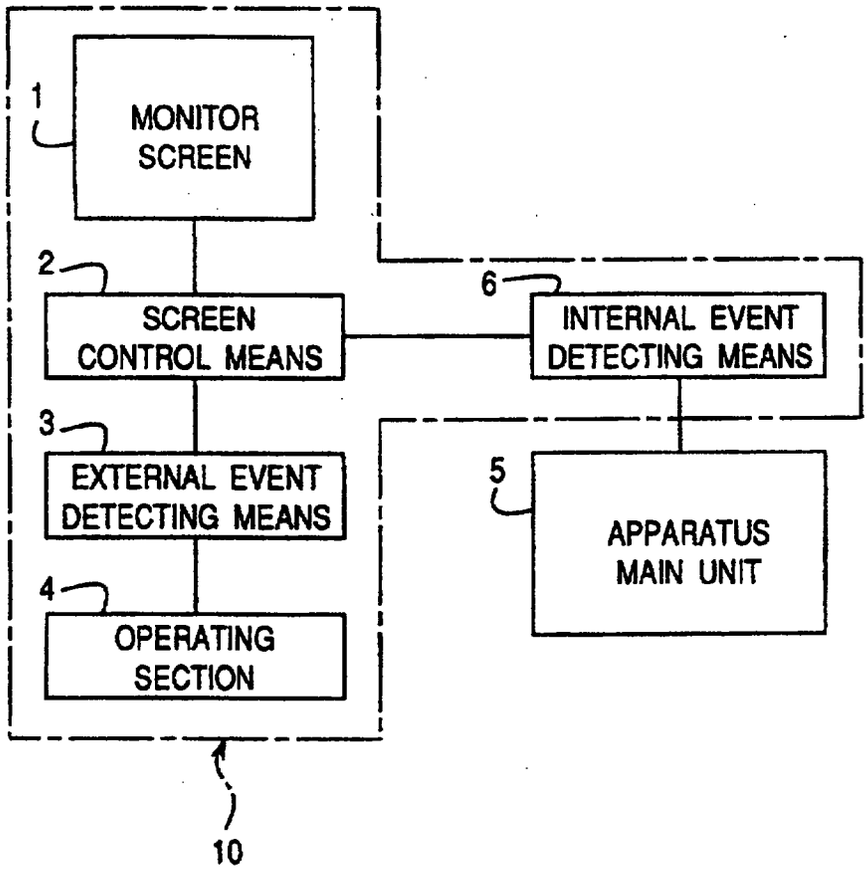

1
MONITOR SCREEN
2
SCREEN CONTROL MEANS
3
EXTERNAL EVENT DETECTING MEANS
4
OPERATING SECTION
6
INTERNAL EVENT DETECTING MEANS
5
APPARATUS MAIN UNIT
10

Fig.2

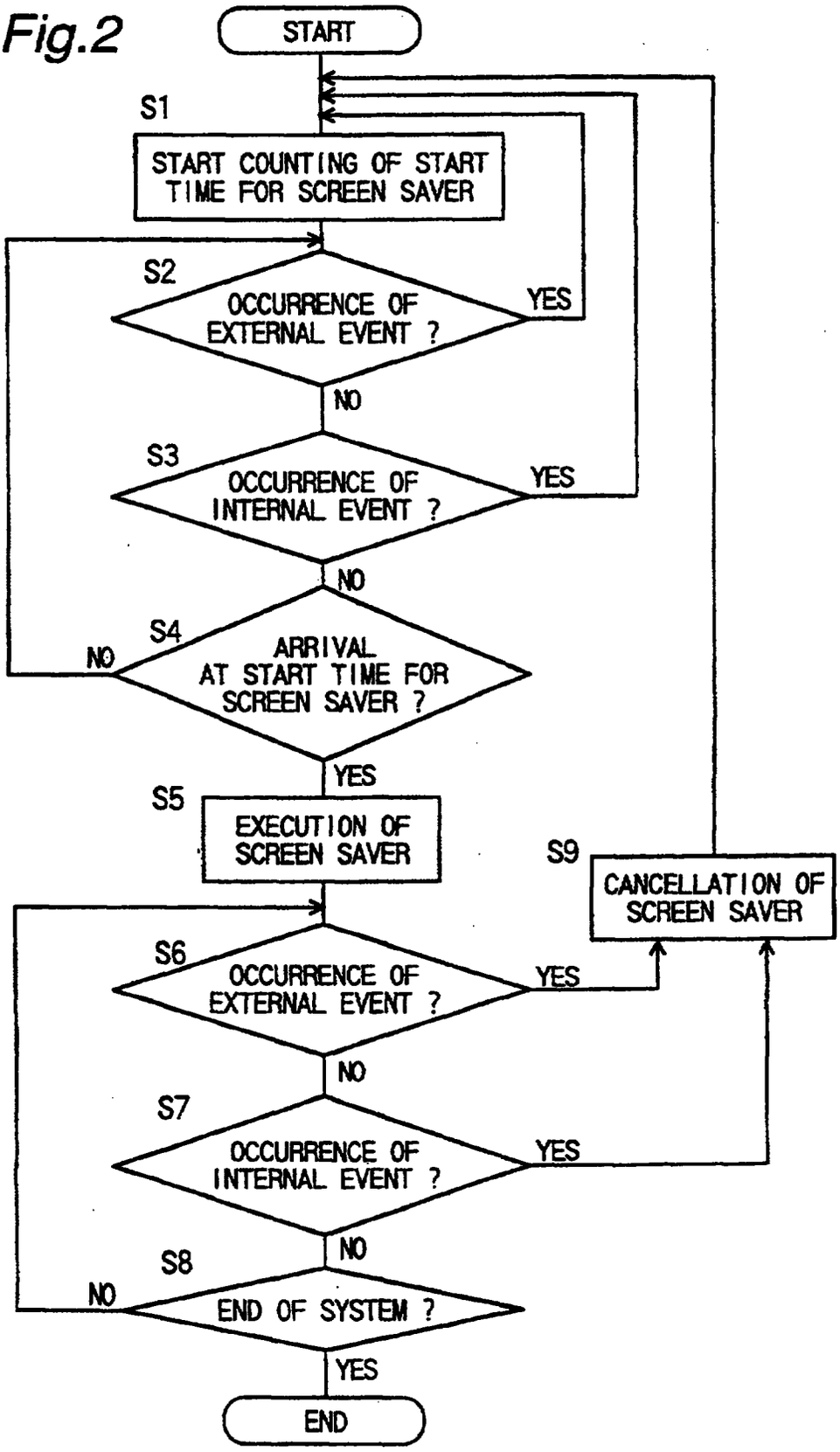

START
S1
START COUNTING OF START TIME FOR SCREEN SAVER
S2
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S3
OCCURRENCE OF INTERNAL EVENT ?
YES
NO
S4
ARRIVAL AT START TIME FOR SCREEN SAVER ?
NO
YES
S5
EXECUTION OF SCREEN SAVER
S9
CANCELLATION OF SCREEN SAVER
S6
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S7
OCCURRENCE OF INTERNAL EVENT ?
YES
NO
S8
END OF SYSTEM ?
NO
YES
END

Fig.3

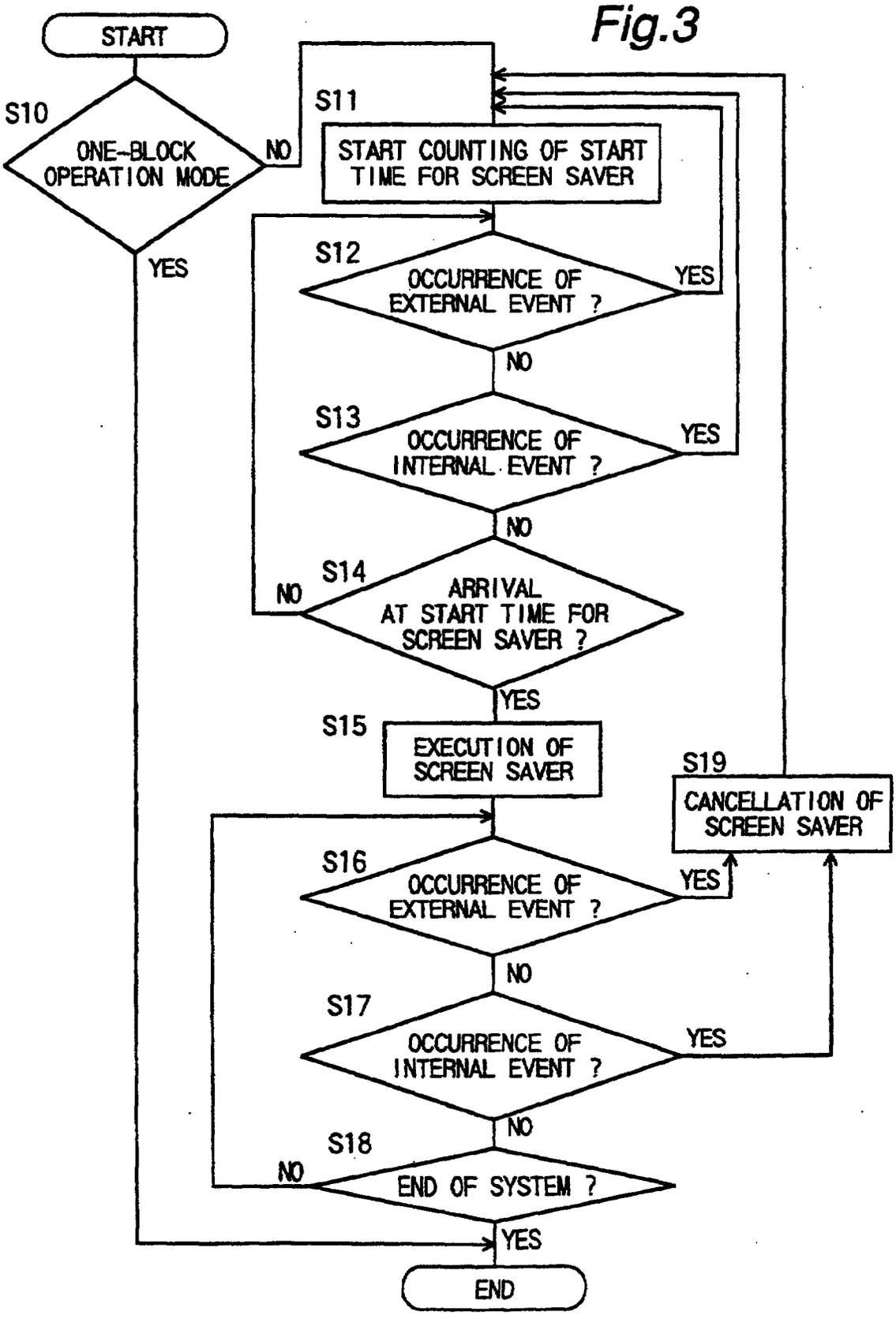

START
S10
ONE-BLOCK OPERATION MODE
NO
YES
S11
START COUNTING OF START TIME FOR SCREEN SAVER
S12
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S13
OCCURRENCE OF INTERNAL EVENT ?
YES
NO
S14
ARRIVAL AT START TIME FOR SCREEN SAVER ?
NO
YES
S15
EXECUTION OF SCREEN SAVER
S19
CANCELLATION OF SCREEN SAVER
S16
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S17
OCCURRENCE OF INTERNAL EVENT ?
YES
NO
S18
END OF SYSTEM ?
NO
YES
END

Fig.4

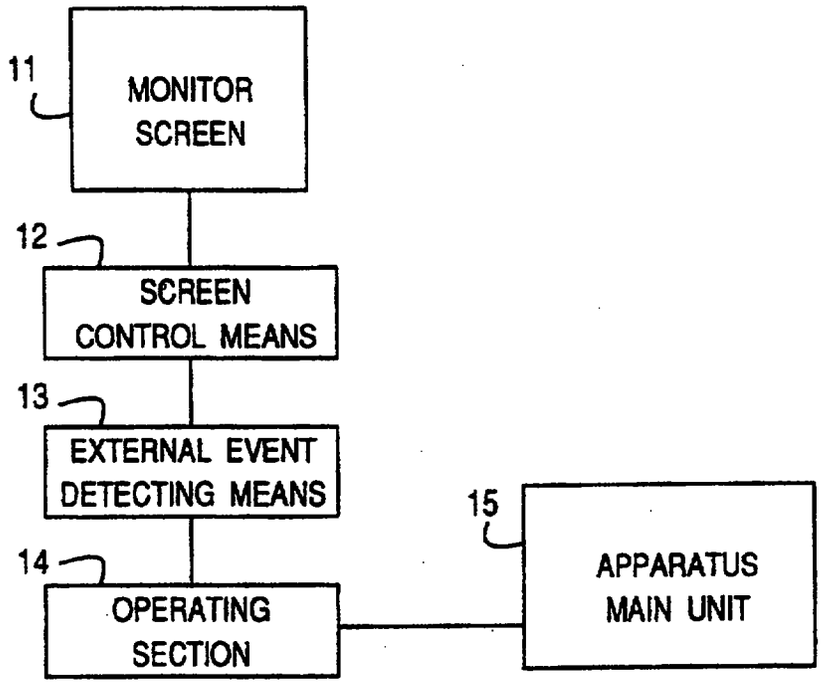

11
MONITOR SCREEN
12
SCREEN CONTROL MEANS
13
EXTERNAL EVENT DETECTING MEANS
14
OPERATING SECTION
15
APPARATUS MAIN UNIT

Fig.5

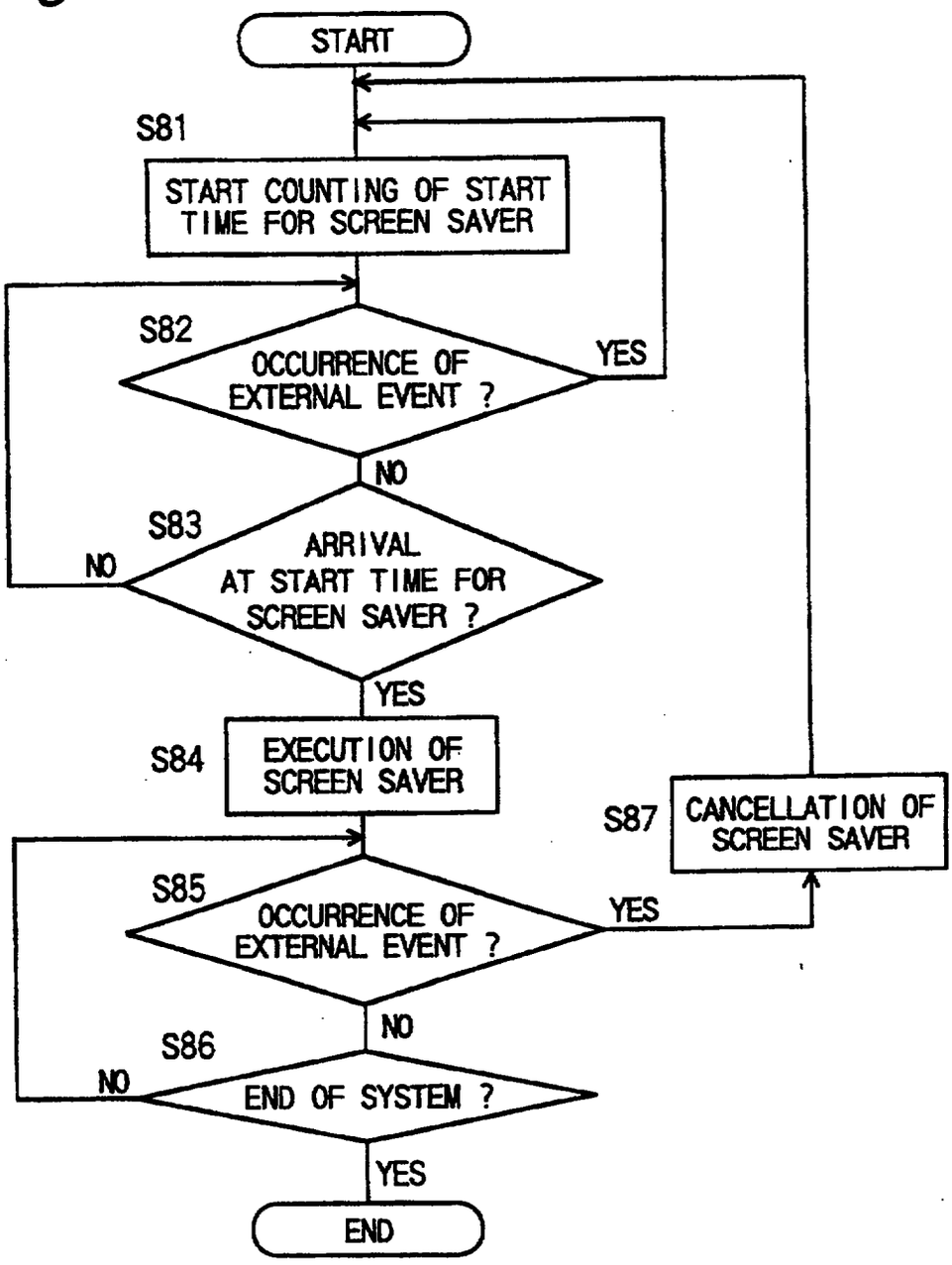

START
S81
START COUNTING OF START TIME FOR SCREEN SAVER
S82
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S83
ARRIVAL AT START TIME FOR SCREEN SAVER ?
NO
YES
S84
EXECUTION OF SCREEN SAVER
S87
CANCELLATION OF SCREEN SAVER
S85
OCCURRENCE OF EXTERNAL EVENT ?
YES
NO
S86
END OF SYSTEM ?
NO
YES
END

Fig.6

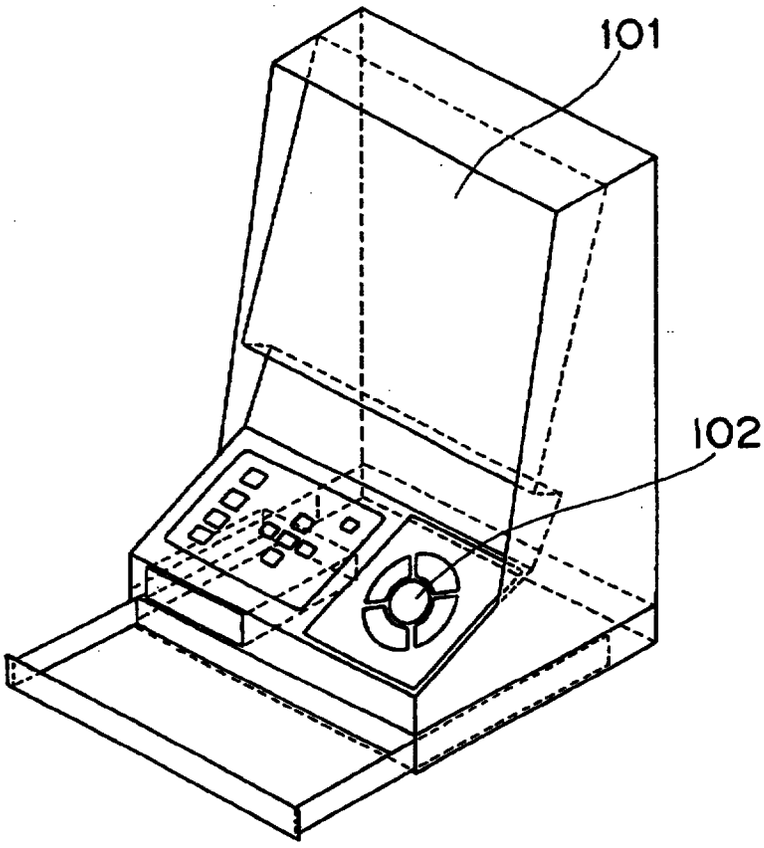


Fig.7

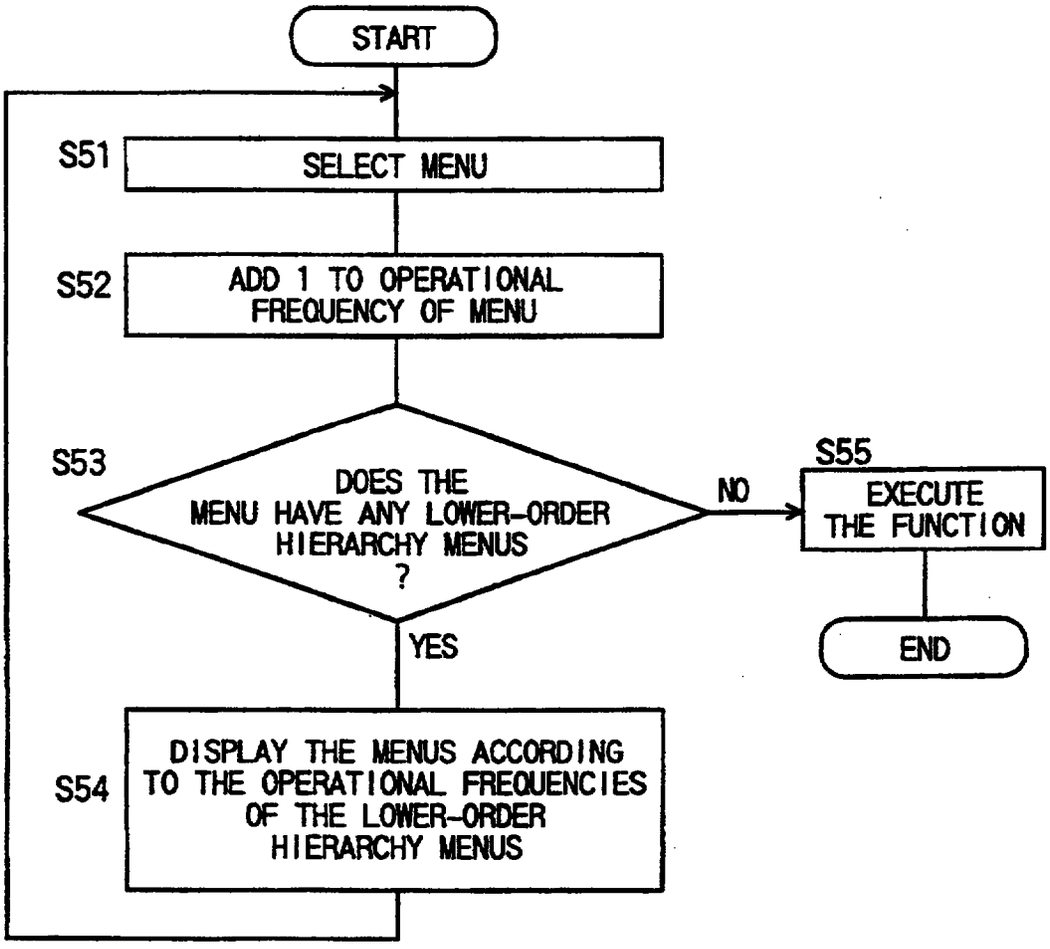

START
S51
SELECT MENU
S52
ADD 1 TO OPERATIONAL FREQUENCY OF MENU
S53
DOES THE MENU HAVE ANY LOWER-ORDER HIERARCHY MENUS ?
NO
S55
EXECUTE THE FUNCTION
END
YES
S54
DISPLAY THE MENUS ACCORDING TO THE OPERATIONAL FREQUENCIES OF THE LOWER-ORDER HIERARCHY MENUS

Fig.8

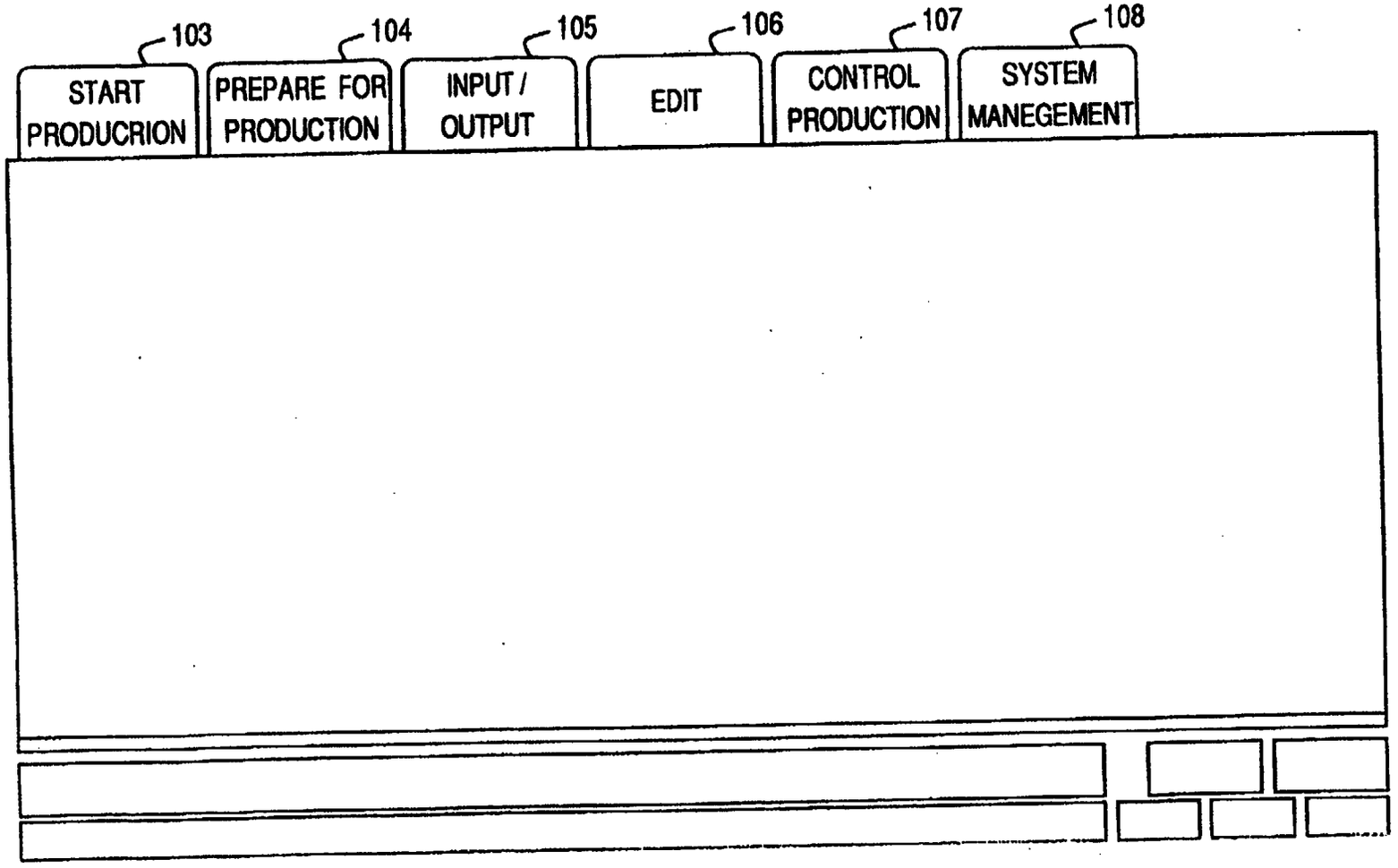

103
104
105
106
107
108
START PRODUCRION
PREPARE FOR PRODUCTION
INPUT / OUTPUT
EDIT
CONTROL PRODUCTION
SYSTEM MANEGEMENT

Fig.9

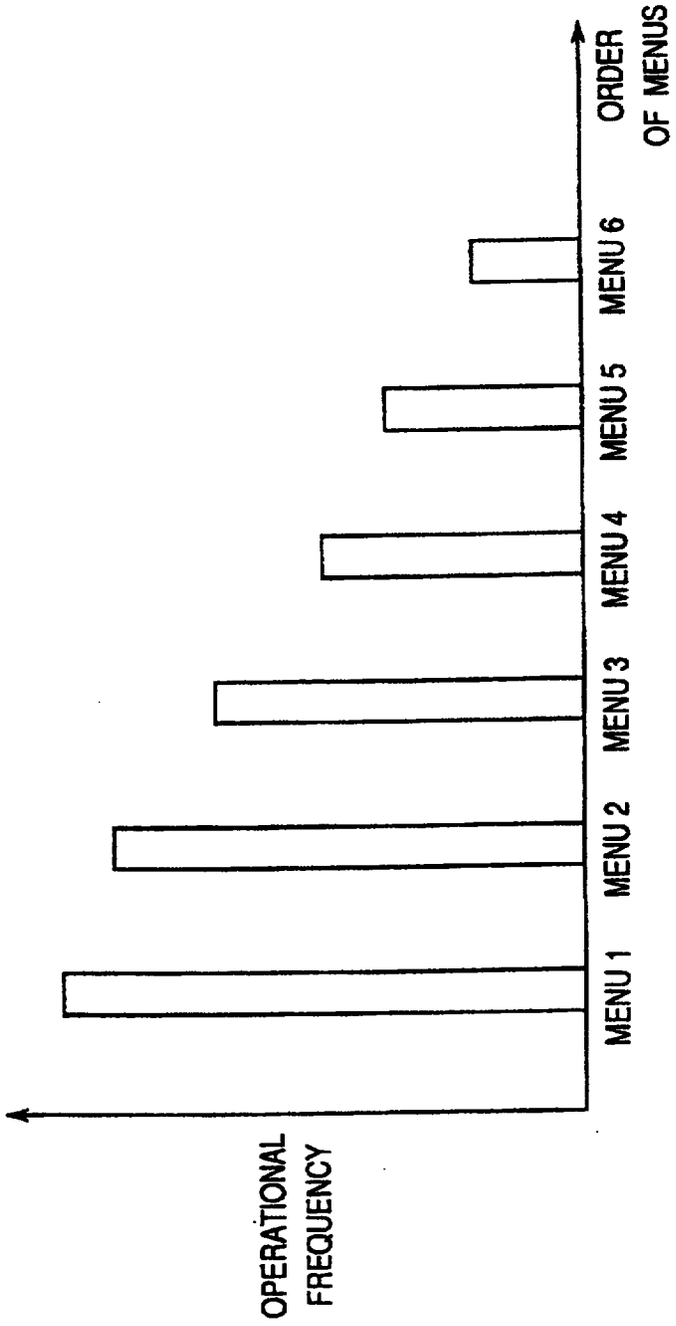

OPERATIONAL FREQUENCY
MENU 1
MENU 2
MENU 3
MENU 4
MENU 5
MENU 6
ORDER OF MENUS

Fig.10

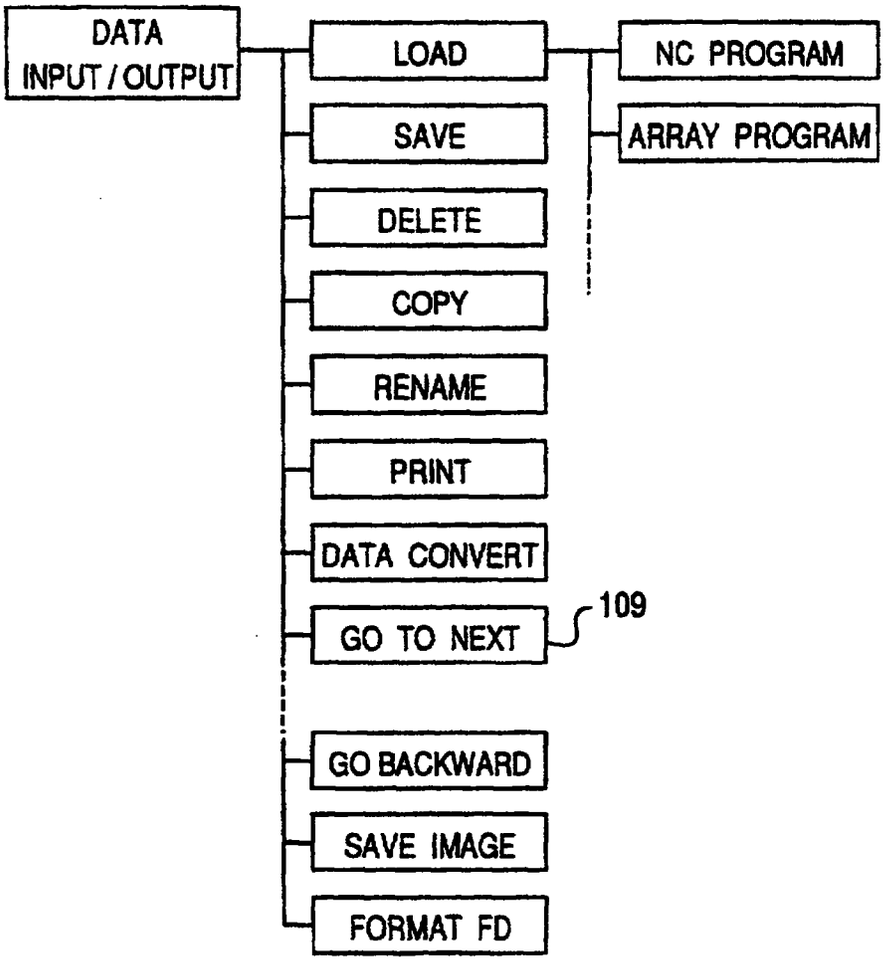

DATA INPUT / OUTPUT
LOAD
SAVE
DELETE
COPY
RENAME
PRINT
DATA CONVERT
GO TO NEXT
109
GO BACKWARD
SAVE IMAGE
FORMAT FD
NC PROGRAM
ARRAY PROGRAM

Fig.11

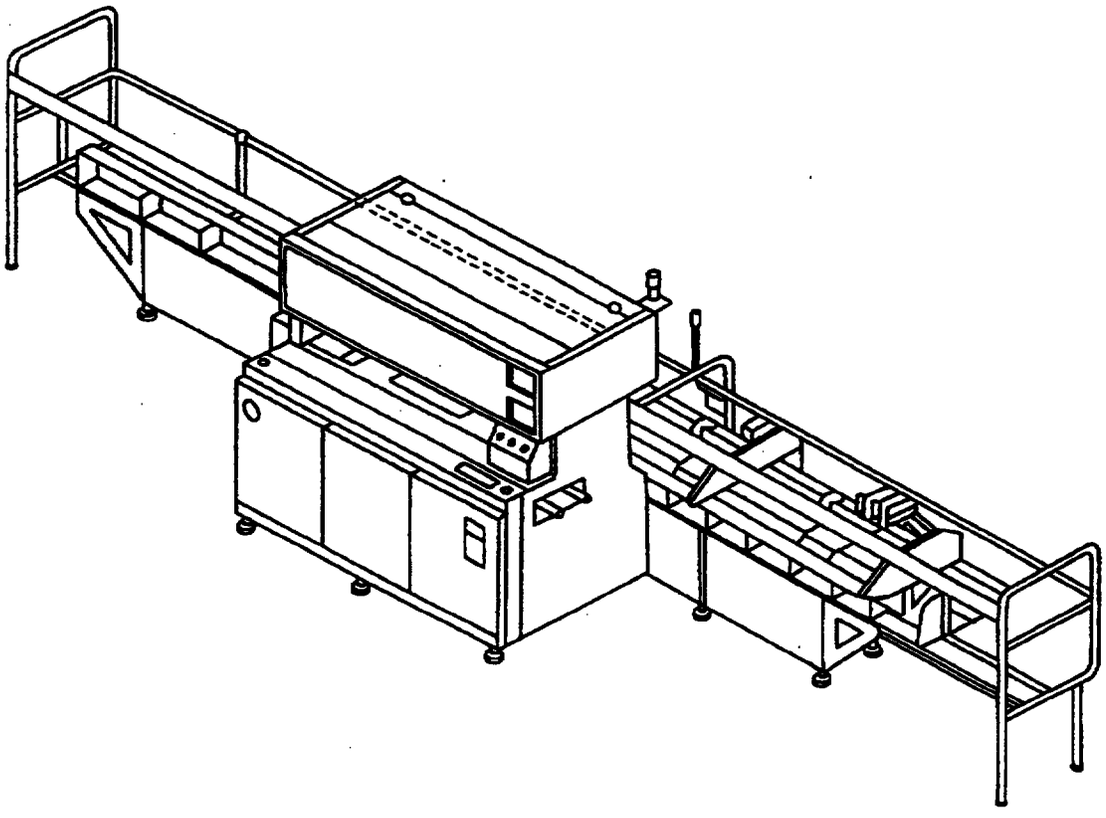


Fig.12

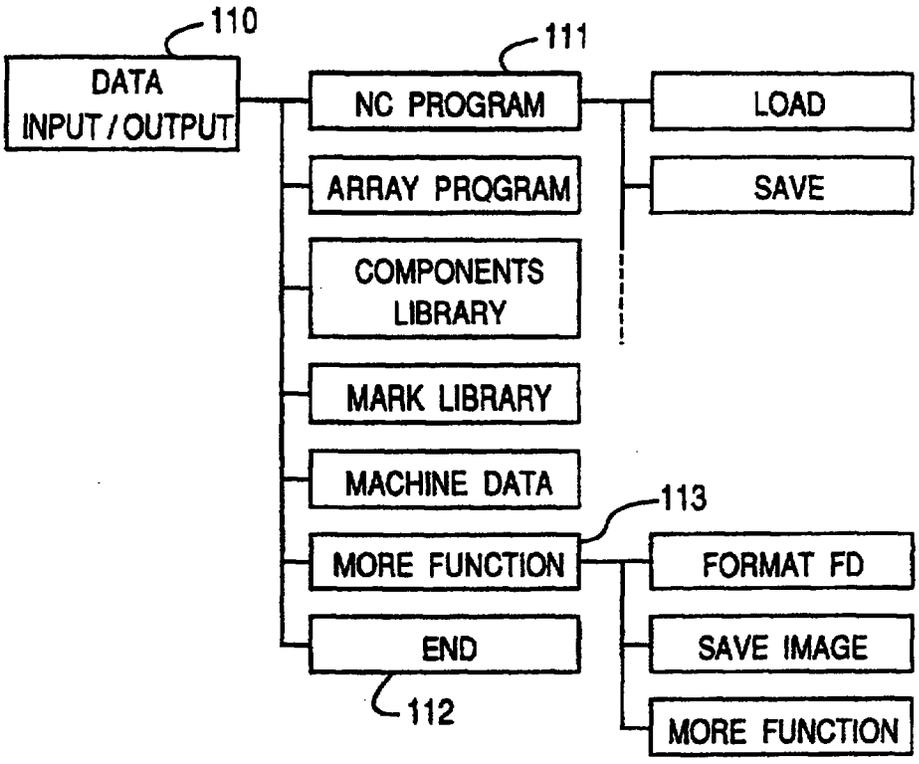

110
DATA INPUT / OUTPUT
111
NC PROGRAM
LOAD
SAVE
ARRAY PROGRAM
COMPONENTS LIBRARY
MARK LIBRARY
MACHINE DATA
113
MORE FUNCTION
FORMAT FD
SAVE IMAGE
MORE FUNCTION
END
112

Fig.13

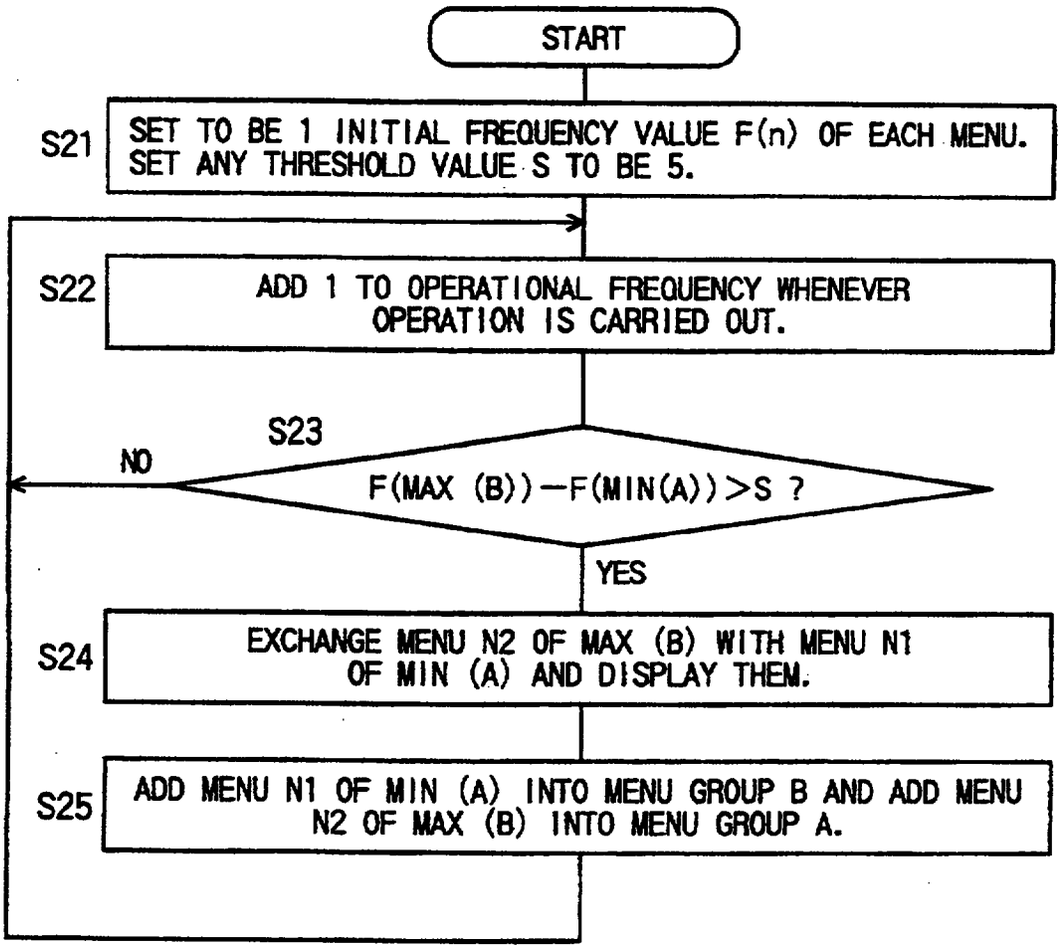

START
S21
SET TO BE 1 INITIAL FREQUENCY VALUE F(n) OF EACH MENU.
SET ANY THRESHOLD VALUE S TO BE 5.
S22
ADD 1 TO OPERATIONAL FREQUENCY WHENEVER OPERATION IS CARRIED OUT.
S23
NO
F(MAX (B))−F(MIN(A))>S ?
YES
S24
EXCHANGE MENU N2 OF MAX (B) WITH MENU N1 OF MIN (A) AND DISPLAY THEM.
S25
ADD MENU N1 OF MIN (A) INTO MENU GROUP B AND ADD MENU N2 OF MAX (B) INTO MENU GROUP A.

Fig.14

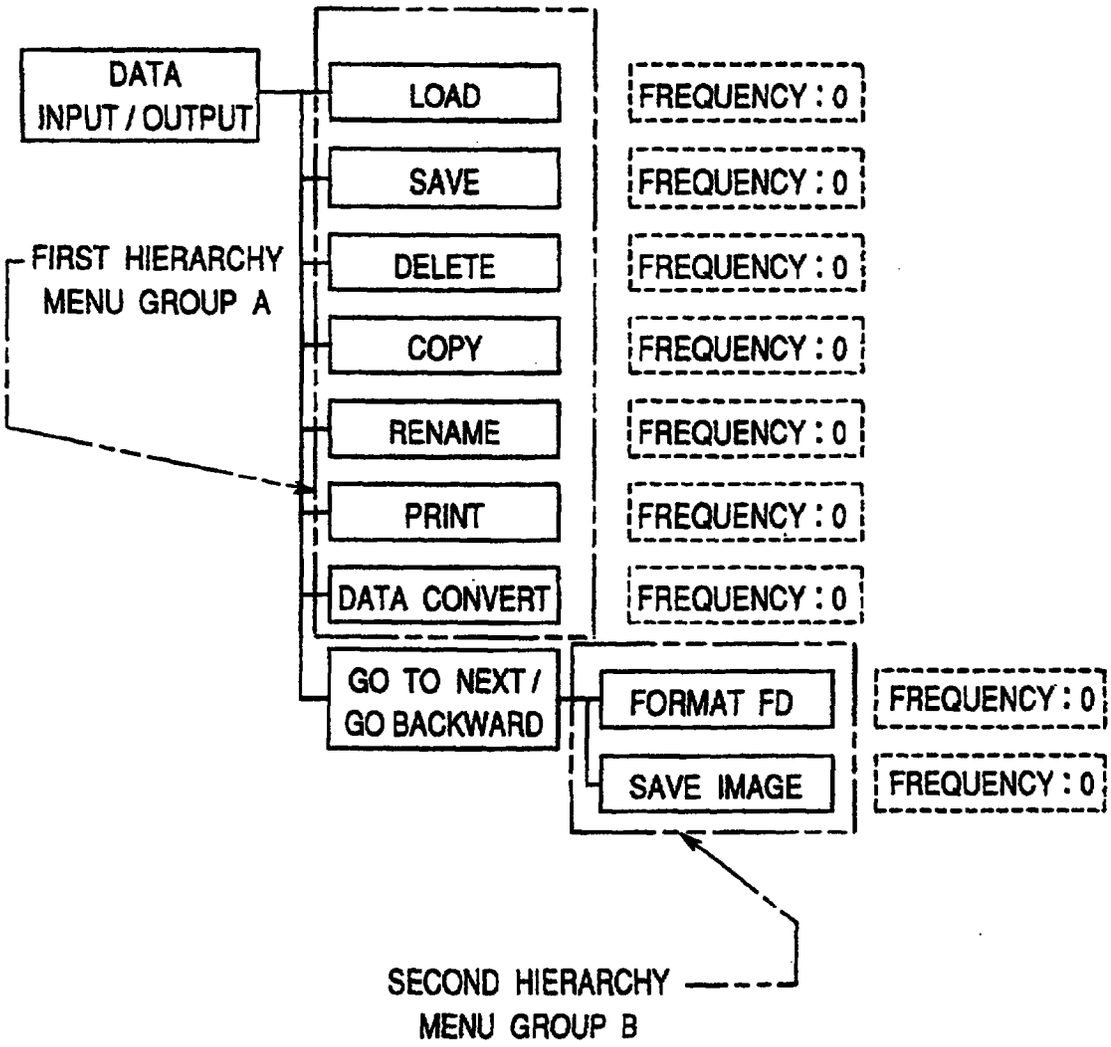

DATA INPUT / OUTPUT
FIRST HIERARCHY MENU GROUP A
LOAD
SAVE
DELETE
COPY
RENAME
PRINT
DATA CONVERT
GO TO NEXT / GO BACKWARD
FORMAT FD
SAVE IMAGE
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
FREQUENCY : 0
SECOND HIERARCHY MENU GROUP B

Fig.15

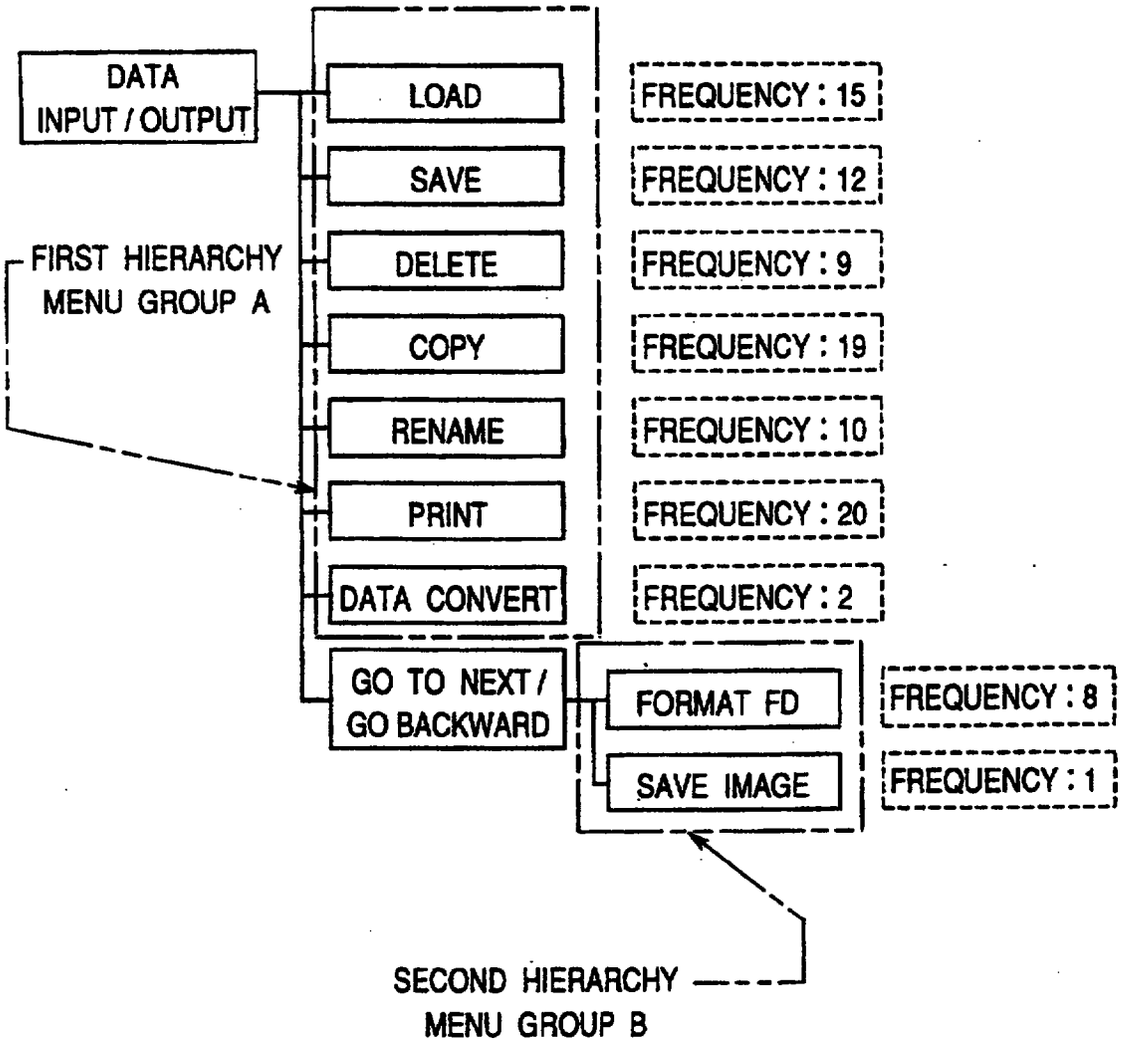

DATA INPUT / OUTPUT
LOAD
SAVE
DELETE
COPY
RENAME
PRINT
DATA CONVERT
GO TO NEXT / GO BACKWARD
FORMAT FD
SAVE IMAGE
FREQUENCY : 15
FREQUENCY : 12
FREQUENCY : 9
FREQUENCY : 19
FREQUENCY : 10
FREQUENCY : 20
FREQUENCY : 2
FREQUENCY : 8
FREQUENCY : 1
FIRST HIERARCHY MENU GROUP A
SECOND HIERARCHY MENU GROUP B

Fig.16

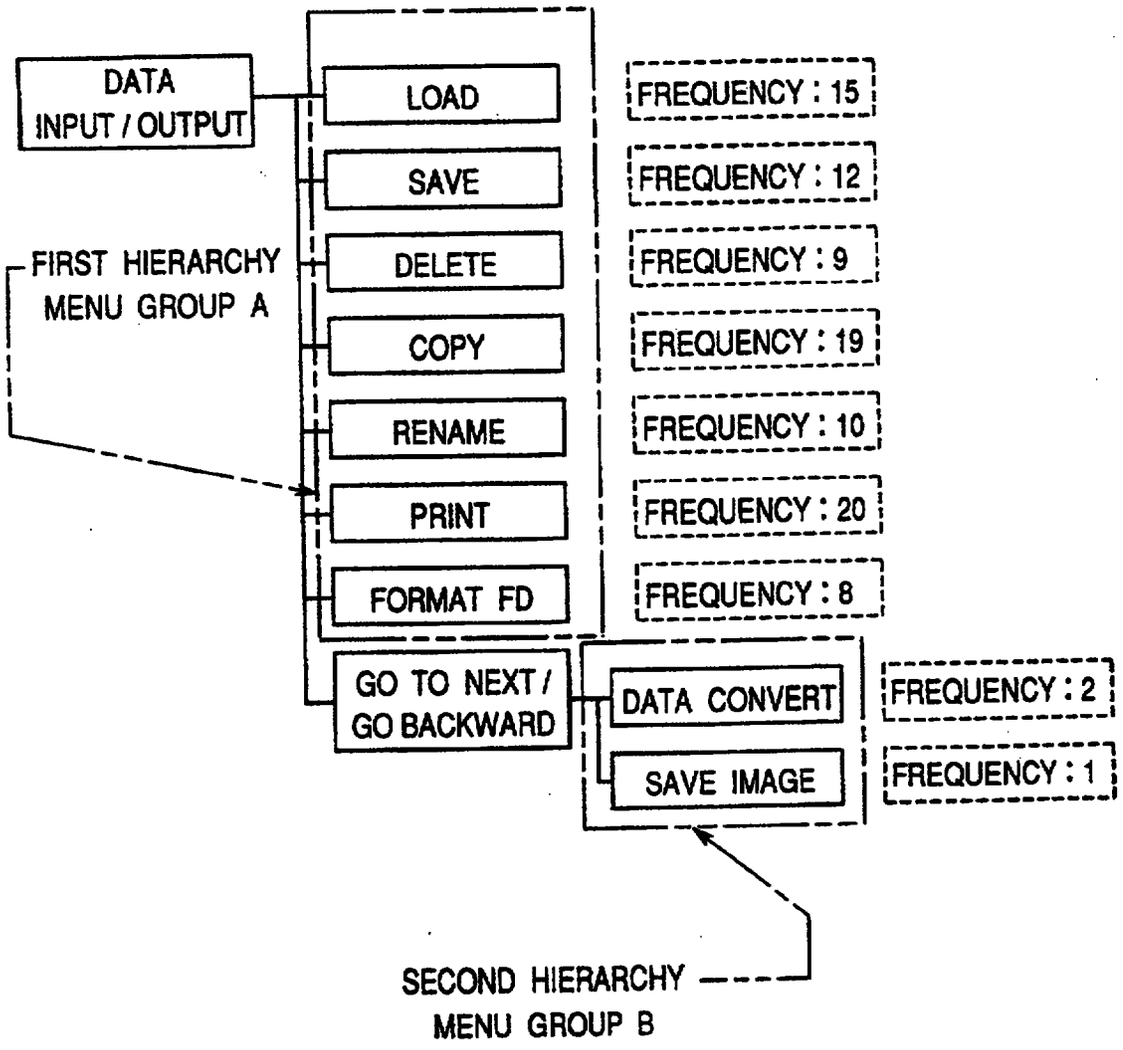

DATA INPUT / OUTPUT
LOAD
SAVE
DELETE
COPY
RENAME
PRINT
FORMAT FD
GO TO NEXT / GO BACKWARD
DATA CONVERT
SAVE IMAGE
FREQUENCY : 15
FREQUENCY : 12
FREQUENCY : 9
FREQUENCY : 19
FREQUENCY : 10
FREQUENCY : 20
FREQUENCY : 8
FREQUENCY : 2
FREQUENCY : 1
FIRST HIERARCHY MENU GROUP A
SECOND HIERARCHY MENU GROUP B

Fig.17

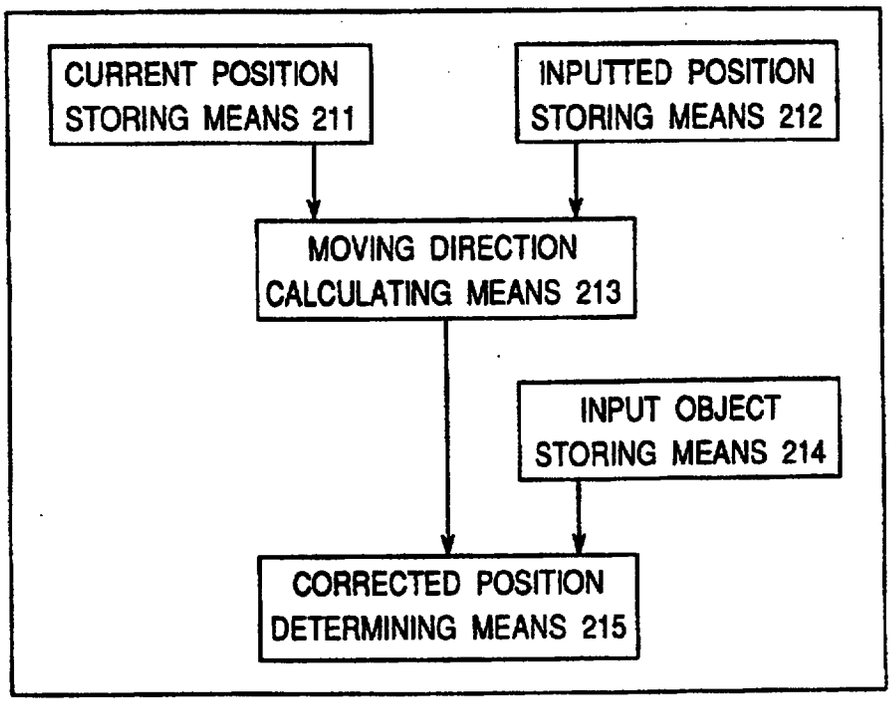

CURRENT POSITION STORING MEANS 211
INPUTTED POSITION STORING MEANS 212
MOVING DIRECTION CALCULATING MEANS 213
INPUT OBJECT STORING MEANS 214
CORRECTED POSITION DETERMINING MEANS 215

Fig.18

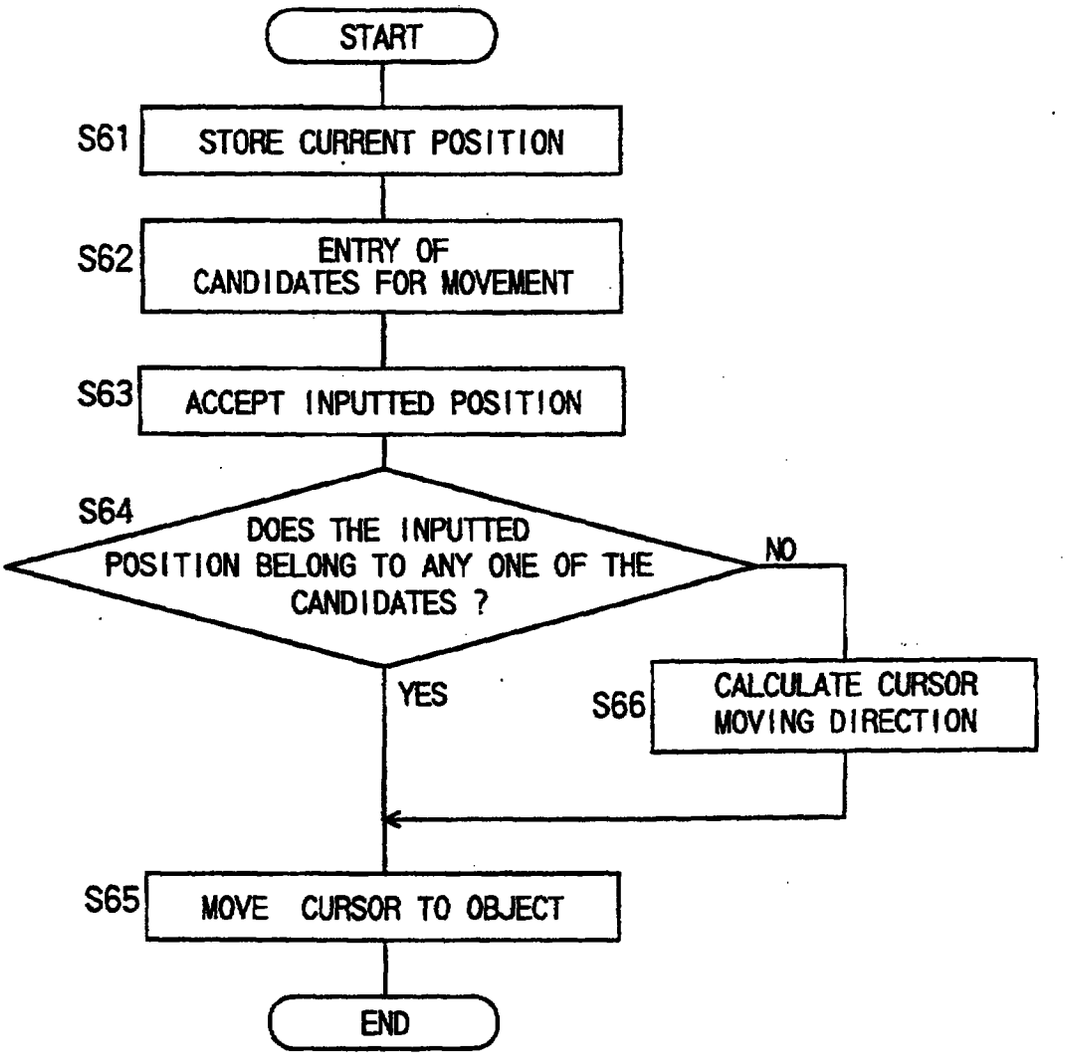

START
S61
STORE CURRENT POSITION
S62
ENTRY OF CANDIDATES FOR MOVEMENT
S63
ACCEPT INPUTTED POSITION
S64
DOES THE INPUTTED POSITION BELONG TO ANY ONE OF THE CANDIDATES ?
NO
YES
S66
CALCULATE CURSOR MOVING DIRECTION
S65
MOVE CURSOR TO OBJECT
END

Fig.19A

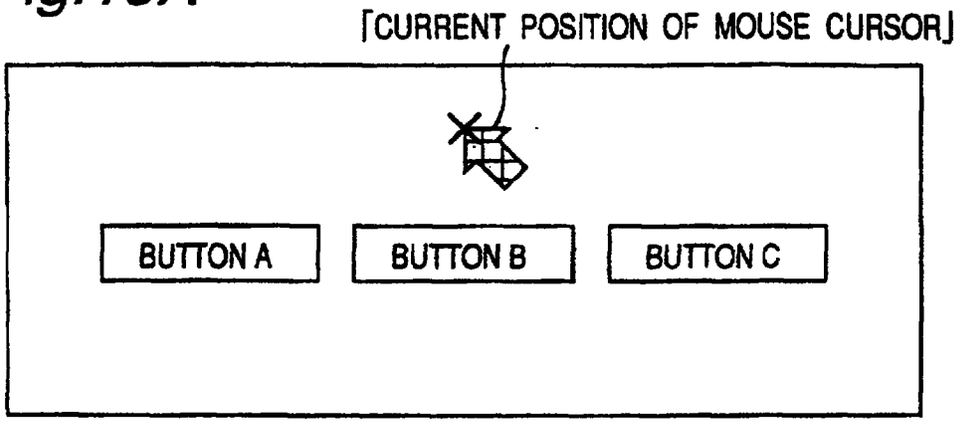


Fig.19B

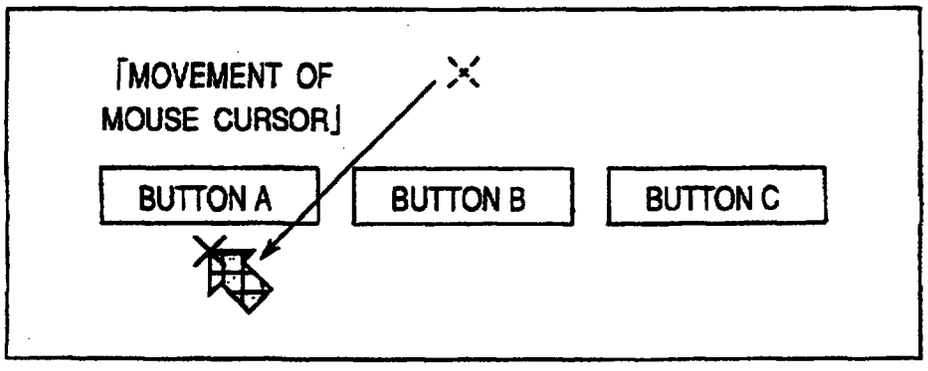


Fig.19C

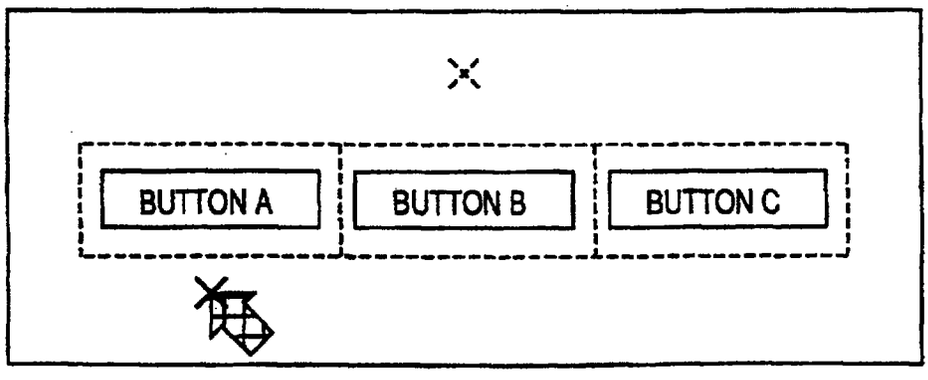


Fig.20A

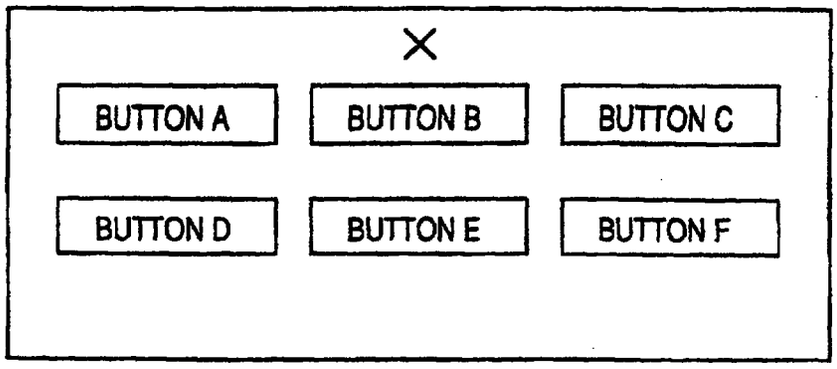


Fig.20B

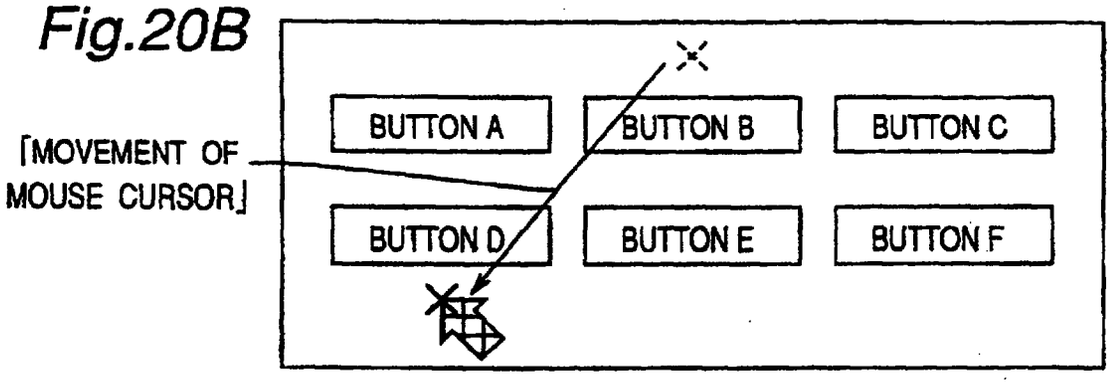


Fig.20C

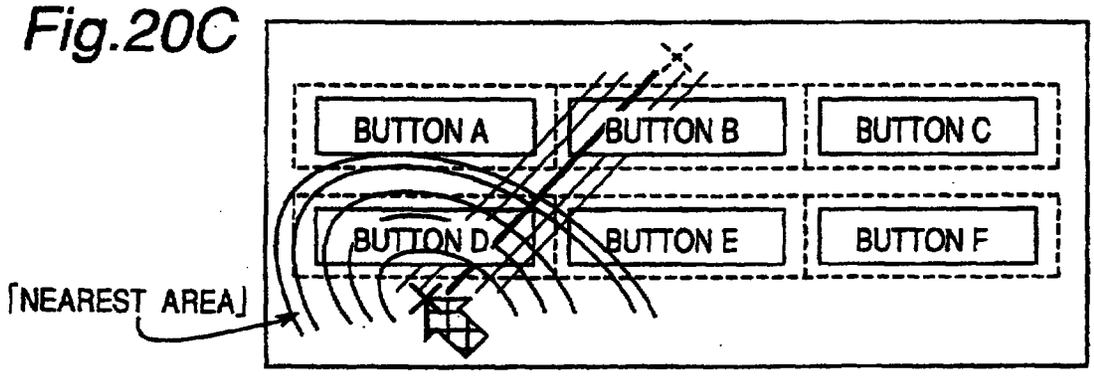


Fig.20D

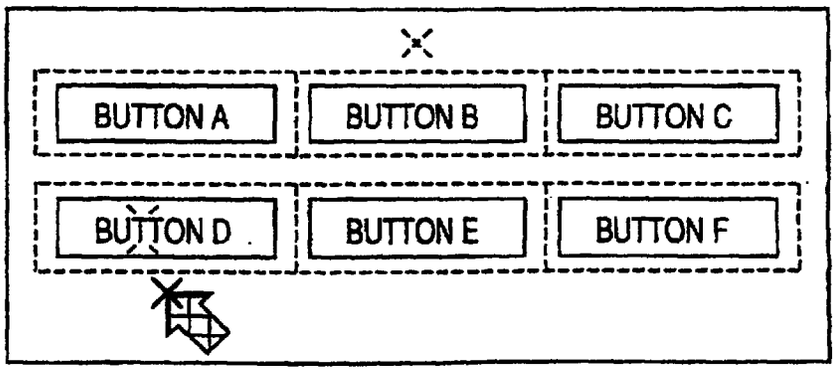


Fig.21

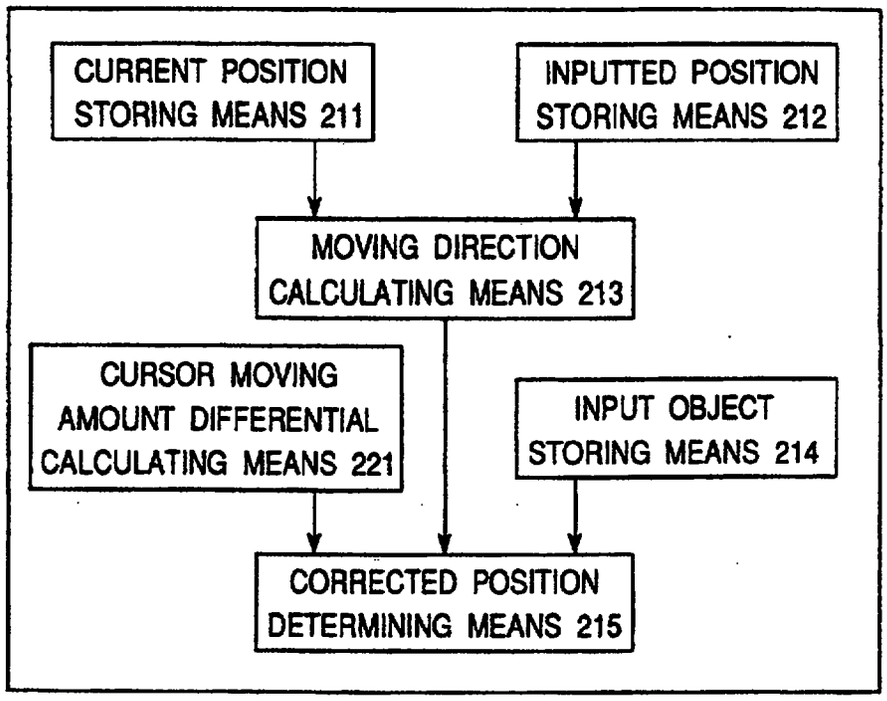

CURRENT POSITION STORING MEANS 211
INPUTTED POSITION STORING MEANS 212
MOVING DIRECTION CALCULATING MEANS 213
CURSOR MOVING AMOUNT DIFFERENTIAL CALCULATING MEANS 221
INPUT OBJECT STORING MEANS 214
CORRECTED POSITION DETERMINING MEANS 215

Fig.22

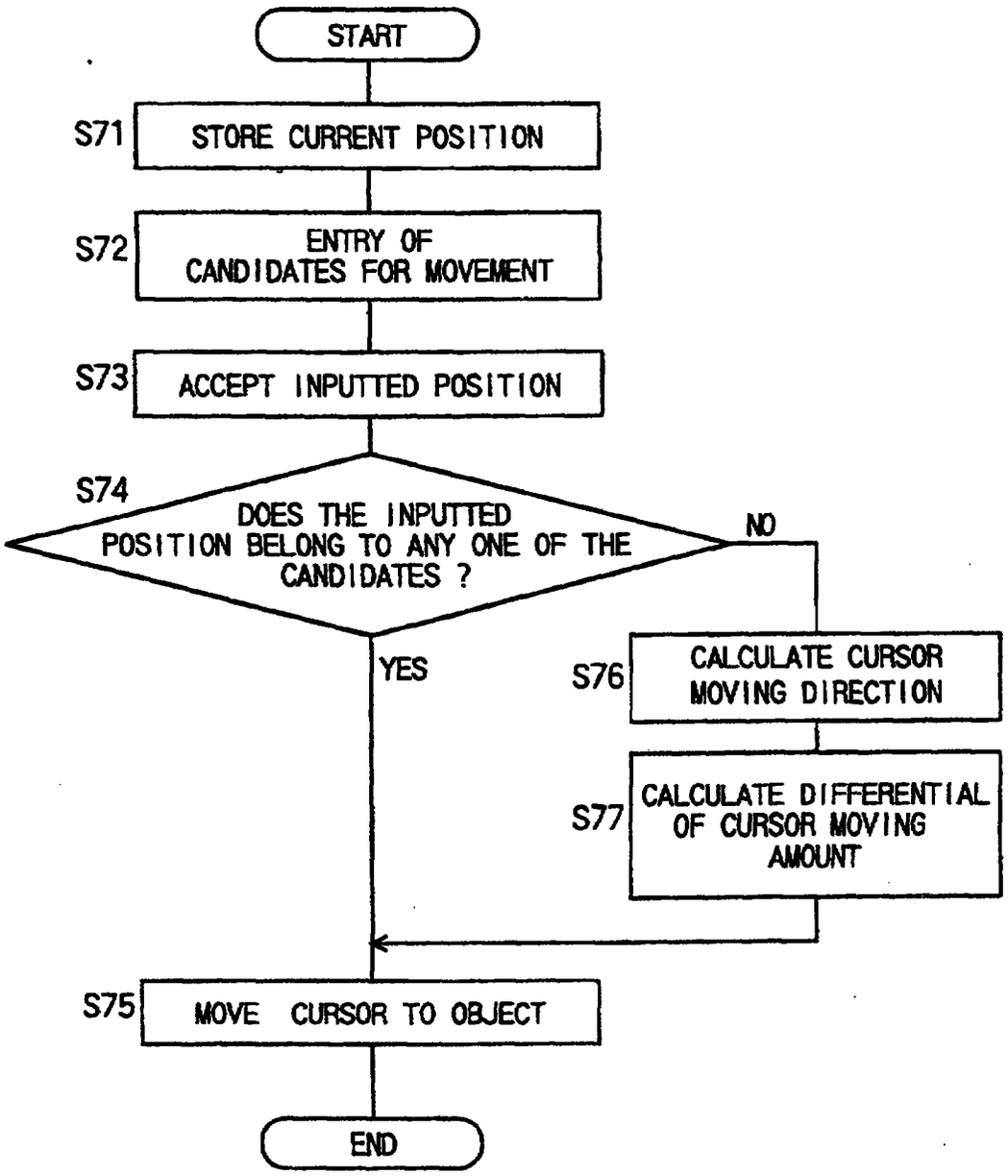

START
S71
STORE CURRENT POSITION
S72
ENTRY OF CANDIDATES FOR MOVEMENT
S73
ACCEPT INPUTTED POSITION
S74
DOES THE INPUTTED POSITION BELONG TO ANY ONE OF THE CANDIDATES ?
NO
YES
S76
CALCULATE CURSOR MOVING DIRECTION
S77
CALCULATE DIFFERENTIAL OF CURSOR MOVING AMOUNT
S75
MOVE CURSOR TO OBJECT
END

Fig.23

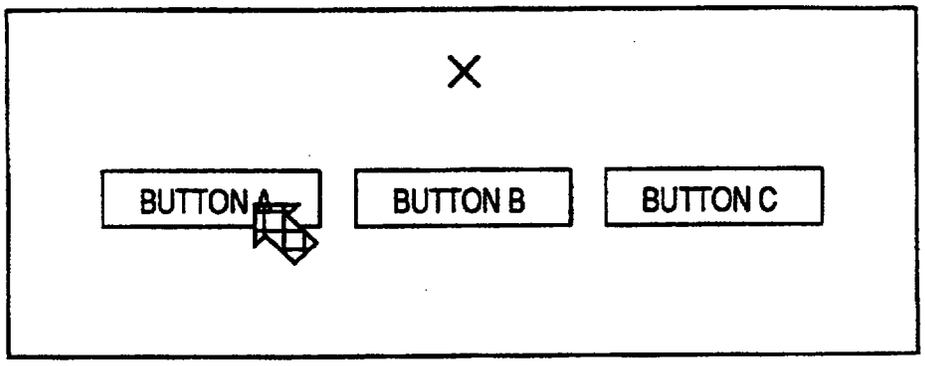
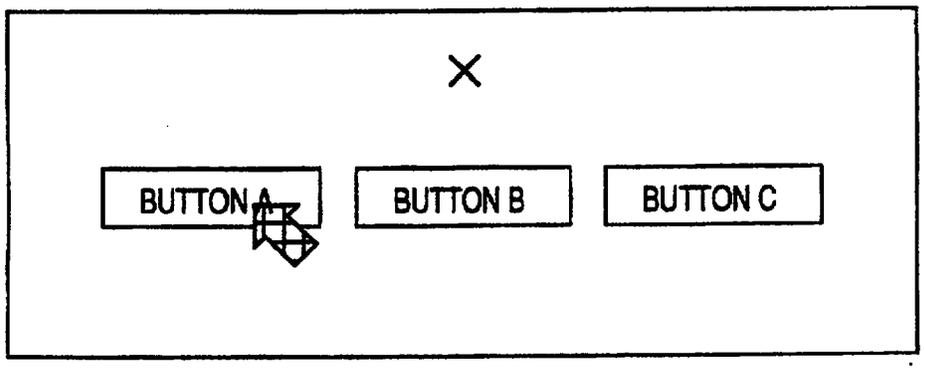


Fig.24



erasing the image on the monitor screen or by displaying moving graphics and characters on the screen. For component mounting apparatuses, because almost no operations from the monitor screen are executed during the production, the screen saver function is required in particular.

The conventional screen control method is described below with reference to Figs. 4 and 5.

In Fig. 4, reference numeral 11 denotes a monitor screen, 12 denotes screen control means for executing the screen saver function, and 13 denotes external event detecting means for canceling the screen saver function. Reference numeral 14 denotes an operating section for operating the apparatus, and 15 denotes an apparatus main unit.

If no operation is executed by the operating section 14 during a predetermined time period, the screen control means 12 executes the screen saver function on the monitor screen 11 to erase the screen. When a key input from the operating section 14 or a depression of the screen saver function canceling key or the like is effected, the external event detecting means 13, upon detecting it, requests the screen control means 12 to cancel the screen saver function, restoring the screen of the monitor screen 11 to its original state (See "Windows

Function Guide", pages 203-204, published by Microsoft Corporation on September 20, 1993).

the same hierarchy. The number of menus that can be displayed simultaneously within one screen is limited by the layout of the operating screen, the hardware configuration of the input device, and the like. Accordingly, when the number of the menus to be arranged on the same hierarchy exceeds this limit due to the function tree structure, the menus are divided into a plurality of groups and special menus for switching among the groups is newly provided to change over the group of menus to be displayed on the screen (See "OPERATING INSTRUCTIONS Panasert MPA-III", page 1-41/42, published by Matsushita Electric Industrial Co., Ltd. on September 18, 1992).

In the operation menus arranged as above, when an objective menu is located at a terminal end of the function tree, the user has to trace the menus one by one from upper-order to lower-order hierarchies, i.e., from broader to narrower terms. Besides, in a selection within each hierarchy, the user has to select a menu pertinent to the purpose of an operation from among a plurality of alternatives with the clue of the menu titles.

Generally, the electronic component mounting apparatus is required to have a large number of functions in controlling the apparatus, managing and editing data with which the apparatus deals, and the like, so that the

operation menus are large-scaled and complicated. Accordingly, to quickly know the location of a menu that

AMENDED SHEET

operations using the operation menus of the apparatus. Accordingly, it is difficult to arrange the fixed operation menus provided by the manufacturer so that the ways in which all the users run the apparatus are satisfied.

On the other hand, conventionally, in designating a position on an operating screen of a computer by using an input device such as a mouse, track ball or joy stick, a cursor is moved to the objective position, as shown in Fig. 23, by manipulating the mouse or the like. Otherwise, as shown in Fig. 24, the cursor is automatically moved to a default position inputted previously (See "COMPUTER DICTIONARY", page 89, published by Microsoft Press on 1991).

The conventional input methods, however, have had some issues. For example, it would take much time for an operator who is not accustomed to manipulate the mouse or track ball, to move the cursor to the objective position, and such an operator would fail to move the cursor to the objective position just as he or she wants. In some cases, the operation by a keyboard would be rather faster, so that the operator would use both the input device, such as a mouse, and the keyboard, resulting in complicated operation.

DISCLOSURE OF THE INVENTION

Accordingly, an object of the present invention is to provide component mounting method and apparatus in which a screen saver function is automatically canceled as it is necessary, for example when an abnormality has occurred to its apparatus main unit or when an action mode needs monitoring. An object of the present invention is also to provide component mounting method and apparatus in which operation menus are customized optimally for a user by dynamically changing over the operation menus. An object of the present invention is to provide method and apparatus for moving a cursor to an objective position without designating the position in detail with an input device such as a mouse or track ball.

In accomplishing these and other aspects, according to a first aspect of the present invention, there is provided a component mounting method for executing an operation by an operating section through a monitor screen in which a screen control method is used,

the screen control method comprising steps of:

providing a screen control means (2) for executing a screen saver function on the monitor screen when no operation is effected on the operating section during a preset time period;

providing an external event detecting means (3) for canceling the screen saver function upon detection of an event derived from the operating section; and

providing an internal event detecting means (6) for canceling the screen saver function upon detection of an event derived from the apparatus other than the operating section.

According to a second aspect of the present invention, there is provided the component mounting method as defined in the first aspect, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in executing the component mounting method.

According to a third aspect of the present invention, there is provided the component mounting method as defined in the first aspect, wherein in the screen saver function executing step, the screen saver function on the monitor screen is not executed in accordance with an operational mode of the component mounting method.

According to a fourth aspect of the present invention, there is provided a component mounting apparatus comprising a screen control apparatus,

the screen control apparatus comprising:

a monitor screen;

an operating section for executing an operation through the monitor screen;

a screen control means for executing a screen saver function on the monitor screen;

move velocity S1 is at the velocity level 3 (the lowest velocity level), the system chooses the candidate that is the nearer to the position of the initial coordinates, and moves the cursor to the position of the candidate of BUTTON B.

In the above sixth embodiment, although the moving velocity has been classified into three levels, the velocity may be classified into an arbitrary number of levels. Also, for each level of the velocity, the system may choose either the candidate nearer to the position of the initial coordinates or the candidate farther from the position of the initial coordinates, whichever it is, optically.

According to the invention, as described above, in repositioning the input cursor for designation of a position by data input with an input device such as a mouse or track ball in computer operation, the cursor can be easily moved to the objective position only by a rough input of cursor position even without an input of detailed positional designation.

CLAIMS

1. A component mounting method for executing an operation by an operating section (4) through a monitor screen (1) in which a screen control method is used,

the screen control method comprising steps of:

providing a screen control means (2) for executing a screen saver function on the monitor screen when no operation is effected on the operating section during a preset time period;

providing an external event detecting means (3) for canceling the screen saver function upon detection of an event derived from the operating section; and

providing an internal event detecting means (6) for canceling the screen saver function upon detection of an event derived from the apparatus other than the operating section.

2. The component mounting method as defined in claim 1, wherein the event from the apparatus detected by the internal event detecting means is an error or a warning caused in executing the component mounting method.

3. The component mounting method as defined in claim 1, wherein in the screen saver function executing

step, the screen saver function on the monitor screen is not executed in accordance with an operational mode of the component mounting method.

4. A component mounting apparatus comprising a screen control apparatus,