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Certification

Welocalize Translations

TRANSLATOR'S DECLARATION:

I, Nicholas Abraham, hereby declare:

That I possess advanced knowledge of the Japanese and English languages. The attached Japanese into English translation has been translated by me and to the best of my knowledge and belief it is a true, correct and complete translation of: JPH09229706A. I hereby certify under penalty of perjury that the foregoing is true and correct.

A handwritten signature in black ink that reads "Nicholas Abraham". The signature is written in a cursive style and is positioned above a horizontal line.

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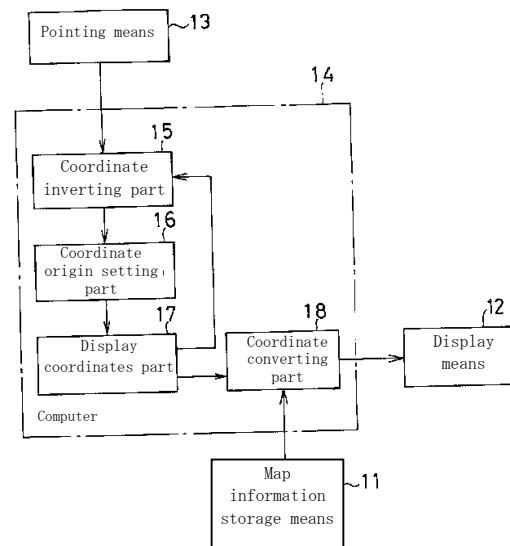
(54) [Title of Invention] NAVIGATION SYSTEM

to be accurately performed on the map.

(57) [Abstract]

[Problem] To enable an enlarged scrolling display at a pointing position via one operation on the screen of a bird's-eye view display to facilitate setting of a destination.

[Resolution Means] In the navigation system of the present invention, by pointing to an arbitrary point using the pointing means 13 on the bird's-eye view displayed on the screen of the display means 12, the display coordinate calculating means 15 obtains display coordinates at the pointing position, and the origin movement display control means 16 to 18 cause the display means 12 to display a new bird's-eye view in which the position on the map corresponding to the pointing position is moved to the display coordinate origin. As a result, with just one pointing operation, the bird's-eye view undergoes a scrolling process where the pointing position is set to the display coordinates origin, and location surroundings corresponding to the pointing position can be enlarged and displayed, allowing a setting operation for a destination



[Scope of Patent Claims]

[Claim 1] A navigation system comprising:

storage means for map data;

reading means for the map data;

display means for forming and displaying the map data read by the reading means as a map whose scale is changed in response to a position on display coordinates on a display screen;

pointing means for performing pointing of an arbitrary position on the display screen;

display coordinate calculating means for obtaining display coordinates of the pointing position;

and origin movement display control means for displaying on the display means a map in which a position on the map corresponding to the pointing position indicated by the pointing means is moved to a display coordinate origin.

[Claim 2] The navigation system of claim 1, wherein the display means displays the map data in a bird's-eye view.

[Claim 3] The navigation system of claim 1, wherein, with the map data, the display means sets the display coordinate origin to a center portion of the display screen and displays a map of a form in which as separation of the display coordinate position from the origin increases, a scale increases.

[Claim 4] The navigation system of any of claims 1 to 3, wherein the origin movement display control means connects between a position pointed to by the pointing means and a current display coordinate origin using a straight line or a curved line, one or a plurality of relay locations are set on this straight line or curved line, and a map is sequentially formed in which the relay location is moved to the display coordinate origin such that a location on the map corresponding to the display coordinate origin on the display screen of the display means moves to the pointing position via the relay location, which is displayed on the display means.

[Claim 5] The navigation system of any of claims 1 to 4, further comprising:

rotating area setting means for setting a rotating area on a map displayed by the display means, and rotating display processing means for rotating and displaying the map on the display means when the pointing means point to a position within the rotating area.

[Claim 6] The navigation system of any of claims

1 to 5, further comprising: destination-set area setting means for setting a destination-set area within the display screen of the display means; and destination setting means for setting a location on a map corresponding to a pointing position as a destination when the pointing position via the pointing means is displayed in the destination-set area.

[Detailed Description of Invention]

[0001]

[Technical Field of Invention] The present invention relates to a navigation system, and relates in particular to a convenient, vehicle-mounted navigation system.

[0002]

[Conventional Art] Conventionally, in car navigation systems in particular, when making a map displayed on the screen of a display scroll, an operator tilts an operating rod in a desired scrolling direction to make the map scroll continuously, and as shown in FIG. 17 as well as the NISSAN Cedric and Gloria (Y33 series) new car manuals, June 1995 issue, page F-114, systems are known wherein 8-direction scrolling touch switches 2 are displayed on a screen 1 displaying a display map, and by touching the touch switch in a desired scrolling direction, an operator scrolls a fixed amount.

[0003] Moreover, among PC application software, as shown in FIG. 18 and as described in the Sumitomo Electric Systems (Co., Ltd.) Atlas Mate Ver. 1.0 User's Manual, systems are known wherein, by pressing a "HOME" key 3 on a display screen 1 using a mouse or another pointing device and indicating an arbitrary position on a display map, the position is automatically moved to the display center and displayed.

[0004]

[Problem to be Solved by Invention] However, among conventional navigation systems such as described above, in no case does a function for making a map scroll on the display screen of a display and a function for modifying the scale of the displayed map work in conjunction, and must be performed by separate operations.

[0005] In addition, there are also navigation systems in operation which include a function for performing a bird's-eye view display wherein a map, enlarged by a small scale around a display coordinate origin, is displayed on the display

screen of a display, and the display is compressed such that as separation from the origin increases, the scale gradually increases, however, in this manner of navigation system, when a destination point far from a current location point is set using a bird' s-eye view and estimated routes are searched automatically on the navigation system side, normally, the bird' s-eye view is displayed in a form wherein the current location of an operator is the display coordinate origin, which increases the scale near the destination and reduces the display due to the characteristics of a bird' s-eye view, and is a problem in that it is difficult to accurately set a destination.

[0006] Furthermore, in navigation systems having a bird' s-eye view display function, none are found that include a function for enlarging the display such that, when an arbitrary point is pointed to in a bird' s-eye view displayed on the screen of a display, by moving a pointing position to a display coordinate origin position, an appearance near the pointing position is readily seen.

[0007] The present invention was made in light of conventional problems such as these, and an object thereof is to provide a navigation system wherein, by forming a map whose scale is changed in response to a distance from a display coordinate origin and pointing to an arbitrary point on the map, which is displayed on the screen of display means, a map in which a location on the map corresponding to the pointing position is displayed on the formed map whose scale is changed in response to a distance from the display coordinate origin, which allows for detailed recognition of an appearance in the vicinity of the pointing position, and facilitates the destination setting operation.

[0008]

[Means for Solving Problem] The navigation system of the invention of claim 1 includes: storage means for map data, reading means for the map data, display means for forming and displaying the map data read by the reading means as a map whose scale is changed in response to a position on display coordinates on a display screen, pointing means for performing pointing of an arbitrary position on the display screen, display coordinate calculating means for obtaining display coordinates of the pointing position, and origin movement display control means for displaying on the display means a map in which a position on the map corresponding to

the pointing position indicated by the pointing means is moved to a display coordinate origin.

[0009] In this navigation system of the invention of claim 1, by pointing to an arbitrary point using the pointing means on the map whose scale is changed in response to a display coordinate position displayed on the screen of the display means, the display coordinate calculating means obtains display coordinates at the pointing position, and the origin movement display control means cause the display means to display the map in which the position on the map corresponding to the pointing position is moved to a display coordinate origin.

[0010] As a result, with just one pointing operation, a scrolling process of a map having a pointing position set to a display coordinate origin can be performed, and an appearance around a location corresponding to the pointing position can be enlarged and displayed, allowing a setting operation for a destination to be accurately performed on the map displayed on the screen of the display means.

[0011] The invention of claim 2 is formed such that, in the navigation system of claim 1, the display means displays the map data in a bird' s-eye view.

[0012] In this navigation system of the invention of claim 2, a map display in bird' s-eye view form allows an appearance around a pointing position to be intuitively grasped.

[0013] The invention of claim 3 is formed such that, in the navigation system of claim 1, with the map data, the display means sets the display coordinate origin to a center portion of the display screen and displays a map of a form in which as separation of the display coordinate position from the origin increases, a scale increases.

[0014] In this navigation system of the invention of claim 3, by displaying a formed map wherein a scale at a center portion of a display screen is reduced and the scale is increased moving to the up, down, left, and right surroundings, setting a current position to the center, and pointing to a location thought to be where a destination lies, regardless of whether the destination lies to the east, west, south, or north, an appearance close to the destination can be enlarged and displayed in the center portion of the display screen by one pointing operation, making the destination setting operation easy.

[0015] The invention of claim 4 is such that, in the

navigation system of any of claims 1 to 3, the origin movement display control means connects between a position pointed to by the pointing means and a current display coordinate origin using a straight line or a curved line, one or a plurality of relay locations are set on this straight line or curved line, and a map is sequentially formed in which the relay location is moved to the display coordinate origin such that a location on the map corresponding to the display coordinate origin on the display screen of the display means moves to the pointing position via the relay location, which is displayed on the display means.

[0016] In this navigation system of the invention of claim 4, for the manner of movement from a current position to a location pointed to as a destination on a map on the display screen, maps can be displayed in sequence wherein one or a plurality of relay locations along the way form a display coordinate origin, and from an appearance around these relay locations, for example, an operator can confirm a gas station or convenience store site, the appearance of a complicated intersection, or the like, and can accurately set a final destination.

[0017] The invention of claim 5 further includes, in the navigation system of any of claims 1 to 4, rotating area setting means for setting a rotating area on a map displayed by the display means, and rotating display processing means for rotating and displaying the map on the display means when the pointing means point to a position within the rotating area.

[0018] In this navigation system of the invention of claim 5, pointing to a position within a rotating area rotates a map such that a traveling direction is upward, with a pointing position as a display coordinate origin. Therefore, the operator can intuitively grasp an appearance around a destination headed to next.

[0019] The invention of claim 6 further includes, in the navigation system of any of claims 1 to 5, destination-set area setting means for setting a destination-set area within the display screen of the display means, and destination setting means for setting a location on a map corresponding to a pointing position as a destination when the pointing position via the pointing means is displayed in the destination-set area.

[0020] In this navigation system of the invention of claim 6, a pointing operation within a

destination-set area sets a pointing position thereof as a destination. Therefore, in setting a destination far from a current location, a map close to the destination can be enlarged and displayed by one pointing operation, and a destination can be accurately set by the operator. Moreover, in setting a destination close to a current location, a destination can be set by one pointing operation, which improves operability.

[0021]

[Effect of Invention] According to the invention of claim 1, with just one pointing operation, a map can be scrolled such that a location on the map corresponding to a pointing position thereof comes to a display coordinate origin, an appearance around the location corresponding to the pointing position can be enlarged and displayed, and a setting operation for a destination can be accurately performed on the map displayed on the screen of the display means.

[0022] According to the invention of claim 2, an appearance around a destination can be intuitively grasped by an operator via a map display in bird's-eye view form, and accurate setting of a destination can be performed.

[0023] According to the invention of claim 3, because a formed map is displayed wherein a scale at a center portion of a display screen is reduced and the scale is increased moving to the up, down, left, and right surroundings, by setting a current position to the center and pointing to a location thought to be where a destination lies, regardless of whether the destination lies to the east, west, south, or north, the map can be scrolled and an appearance close to the destination can be enlarged and displayed in the center portion of the display screen by one pointing operation, making the destination setting operation easy and able to be performed accurately.

[0024] According to the invention of claim 4, for the manner of movement from a current position to a location pointed to as a destination on a map on the display screen, maps can be scrolled and displayed in sequence wherein, while scrolling the map, a location on the map corresponding to one or a plurality of relay locations forms a display coordinate origin, and from an appearance around these relay locations, for example, an operator can accurately set a final destination while confirming

a gas station or convenience store site, the appearance of a complicated intersection, or the like.

[0025] According to the invention of claim 5, pointing of a position within a rotating area enables rotation and display of a map such that a traveling direction is upward, with the pointing position as a display coordinate origin, allowing the operator to intuitively grasp an appearance of a region they are headed to, and allowing them to accurately set a destination.

[0026] According to the invention of claim 6, in setting a destination far from a current location, a map close to the destination can be enlarged and displayed by one pointing operation, and a destination can be accurately set by the operator. Moreover, in setting a destination close to a current location, a destination can be set by one pointing operation, which improves operability.

[0027]

[Embodiments of Invention] Embodiments of the present invention will be described in detail hereinafter based on the drawings. FIG. 1 shows a functional configuration of the first embodiment of the present invention, configured from: map information storage means 11 for reading map information from a storage medium such as a CD-ROM on which map information is recorded, display means 12 such as a color LCD and miniaturized CRT display device, pointing means 13 for performing a pointing operation at an arbitrary position on the screen by a manner such as a touch panel with which the display means 12 is equipped or a joystick for moving a cursor displayed on the screen of the display means 12, and a computer 14 for executing various calculation processing required for navigation.

[0028] Furthermore, the computer 14 has, as elements for executing processing functions of the first embodiment of the present invention, a coordinate inverting part 15, a coordinate origin setting part 16, a display coordinates part 17, and a coordinate converting part 18. Note that these diverse functional parts are recorded as software programs, however here, each function is expressed as a block.

[0029] Next, the actions of the navigation system having the above configuration will be described. In terms of general action, the navigation system of this embodiment works in conjunction with a GPS (global positioning system) to detect a current

location of a vehicle, and reads map information including this current position from the map information storage means 11 in the coordinate converting part 18, and as illustrated in FIG. 3, the current position is displayed on the display means 12 in the form of a bird's-eye view 21 slightly below a display coordinate origin 20. Furthermore, as the operator vehicle advances, the bird's-eye view 21 typically scrolls a little at a time to display a location directly in front of the operator vehicle as a display coordinate origin. In the bird's-eye view 21 of this manner, surroundings 22 close to the display coordinate origin 20 take on an enlarged display having a reduced scale, and as separation from the origin 20 increases, moving upward on the screen, the scale gradually increases, forming a compressed display.

[0030] In this manner of navigation system, now, when an operator sets a destination, and an estimated route from a current position to a destination is automatically calculated on the navigation system side, a destination is set by a procedure such as the following. In the bird's-eye view 21 such as shown in FIG. 4(a) in which a region directly in front of a current position is enlarged and displayed on the display coordinate origin 20, when a position 23 marked as a destination lying far from the current position is pointed to using the pointing means 13, as illustrated in FIG. 4(b), a bird's-eye view 21' is displayed in which the pointed to position 23 is moved to the display coordinate origin 20.

[0031] In this bird's-eye view 21', a region close to a destination 24 is enlarged and displayed so that the pointing position 23 moves to the display coordinate origin. Thus, the operator can read the destination 24 in the enlarged region from the bird's-eye view and accurately carry out the setting operation.

[0032] The above setting operation process for a destination will be described based on the flowchart in FIG. 2. When the pointing means 13 is used for pointing to the position 23 close to a place where the destination is thought to lie in the bird's-eye view 21 displayed on the screen of the display means 12 (step S1), the coordinate inverting part 15 inverts coordinates of the pointing position on the screen (display coordinates) to coordinates in the corresponding map information (step S2).

[0033] Furthermore, the coordinate origin setting part 16 moves a pointing position 23 to the display coordinate origin 20 (step S3), obtains a parallel translation formula, which is required by the display coordinates part 17 at this time for the original pointing position 23 to the display coordinate origin 20 on the display coordinates, and further obtains a parallel translation formula which corresponds on the map coordinates (step S4).

[0034] Next, in the coordinate converting part 18, from the origin on the current map coordinates, a location serving as an origin on new map coordinates is obtained by the above parallel translation formula, and with this location as the new location, map information in a predetermined display range is read from the map information storage means 11, which is displayed on the screen of the display means 12 in the bird's-eye view 21' form by converting this map information to display coordinates (steps S5, S6).

[0035] Thereby, as shown in FIG. 4(a), close-by the destination in the bird's-eye view 21 of the display screen undergoes just one pointing operation, which, as shown in FIG. 4(b), automatically displays the bird's-eye view 21' with the pointed to location 23 newly positioned at the origin 20, a region close to the destination 24 is enlarged and displayed on the screen, allowing the destination to be accurately determined and set.

[0036] Next, the second embodiment of the present invention will be described based on FIG. 5. This second embodiment, rather than having the form of the screen display of the display means 12 be a bird's-eye view, is characterized by the display coordinate origin 20 being set to the screen center, and a map 25 being displayed in a display form wherein, as separation from this origin 20 increases toward the margins of the screen, a scale increases. The other configurations are the same as those of the first embodiment.

[0037] Therefore, in the case of this second embodiment, as shown in FIG. 6(a), even when a destination lies in any direction up, down, left, or right (east, west, south, or north on the map) of the origin 20 on the map 25 of the display screen, the position 23 where this destination is thought to lie undergoes a pointing operation, and as shown in FIG. 4(b), the pointing position 23 can be moved

to the origin 20 at the screen center to enlarge and display a region close to the destination 24, which allows the destination 24 to be accurately determined and a setting operation to be performed.

[0038] Next, the third embodiment of the present invention will be described based on FIGS. 7 to 9. As shown in FIG. 7, the hardware configuration of this navigation system of the third embodiment is configured of: the map information storage means 11 for reading and outputting map information from an installed CD-ROM on which map information is recorded, the display means 12 for displaying diverse information other than map information, the pointing means 13 for pointing to a desired position with respect to a map displayed on the screen of the display means 12, and the computer 14 for executing various calculation processes.

[0039] Furthermore, the computer 14 has, as elements for executing processing functions of the third embodiment, the coordinate inverting part 15, a relay location setting part 19, the coordinate origin setting part 16, the display coordinates part 17, and the coordinate converting part 18. Note that these diverse functional parts are recorded as software programs, however likewise here, each function is expressed as a block.

[0040] Next, the actions of the navigation system having the above configuration will be described. In terms of general action, the navigation system of this third embodiment also works in conjunction with a GPS similarly to the first embodiment to detect a current location of a vehicle, and reads map information including this current position from the map information storage means 11 in the coordinate converting part 18, and as illustrated in FIG. 3, a location directly in front of the current position is displayed on the display means 12 in a form of the bird's-eye view 21 that comes to the display coordinate origin 20.

[0041] In this manner of navigation system, now, when an operator sets a destination, and an estimated route from a current position to a destination is automatically calculated on the navigation system side, a destination is set by a procedure such as the following. As shown in FIG. 9(a), in a bird's-eye view 21a in which a location directly in front of a current position is set to the display coordinate origin 20, when the position 23 on which a destination far from the current position is thought to lie is pointed to using the

pointing means 13, a straight line 27 is used by the computer 14 to connect between the display coordinate origin 20 and the pointing position 23, and on this straight line 27, a predetermined number of relay locations, for example, relay locations 27A and 27B, are provided.

[0042] Furthermore, as shown in FIG. 9(b), a bird' s-eye view 21b in a scrolled form is drawn out such that a location on a map corresponding to the first relay location 27A is displayed at the position of the display coordinate origin 20. This bird' s-eye view 21b takes on the form of a map having a region, which is peripheral to the origin on the map corresponding to the pointing position 23, enlarged one step beyond the original bird' s-eye view 21a.

[0043] Then, as shown in FIG. 9(c), a bird' s-eye view 21c in a scrolled form is drawn out such that a location on a map corresponding to the next relay location 27B is displayed at the position of the display coordinate origin 20. This bird' s-eye view 21c takes on the form of a map having a region, which is peripheral to the pointing position 23, further enlarged one step beyond the original bird' s-eye view 21b.

[0044] Then, as shown in FIG. 9(d), a bird' s-eye view 21d in a scrolled form is drawn out wherein the origin on the map corresponding to the original pointing position 23 is scrolled to the display coordinate origin 20 on the display screen. Thereby, the region peripheral to the location on the map corresponding to the original pointing position 23 is displayed in a most enlarged form, allowing an operator to read the destination 24 in the enlarged map from the bird' s-eye view 21d and accurately perform a setting operation.

[0045] The above setting operation process for a destination will be described based on the flowchart in FIG. 8. When the pointing means 13 is used for pointing to the location 23 close to a place where the destination is thought to lie in the bird' s-eye view 21a displayed on the screen of the display means 12 (step S11), the coordinate inverting part 15 inverts coordinates of the pointing position on the screen (display coordinates) to coordinates in the corresponding map information (step S12).

[0046] Furthermore, the relay location setting part 19 sets one or a plurality n of relay locations (in the example in FIG. 9, being the relay locations 27A and 27B, as well as the three pointing positions 23)

between the origin 20 and the pointing position 23 on the display coordinates (step S13).

[0047] Furthermore, the coordinate origin setting part 16 scrolls the location on the map corresponding to the first relay location 27A on the display coordinates so as to come to the position of the display coordinate origin 20 (steps S14, S15), obtains a parallel translation formula, which is required in terms of display coordinates at this time for the display coordinates part 17 to move the relay location 27A to the display coordinate origin 20, and further obtains a parallel translation formula which corresponds on the map coordinates (step S16).

[0048] Next, in the coordinate converting part 18, from the origin on the current map coordinates, a location serving as an origin on new map coordinates is obtained by the above parallel translation formula, and with this location as the new location, map information in a predetermined display range is read from the map information storage means 11, which is displayed on the screen of the display means 12 in the bird' s-eye view 21b form by converting this map information to display coordinates (steps S17, S18).

[0049] Next, once again the coordinate origin setting part 16 makes the location on the map corresponding to the second relay location 27B on the display coordinates scroll so as to come to the position of the display coordinate origin 20 (steps S14, S15), obtains the parallel translation formula, which is required by the display coordinates part 17 at this time in terms of display coordinates to move the relay location 27B to the display coordinate origin 20, and further obtains a parallel translation formula that corresponds in terms of map coordinates (step S16), then obtains a new map coordinate origin from the current map coordinate origin in the coordinate converting part 18 by the above parallel translation formula, and with this location as the new origin, reads the map information for a predetermined display range from the map information storage means 11, and displays this map information in the bird' s-eye view 21c form on the screen of the display means 12 by converting to the display coordinates (steps, S17, S18).

[0050] The processes of the above steps S15 to S18 are performed for only an n number of relay locations set first and ultimately repeated until,

as shown in FIG. 9(d), a location on the map corresponding to the original pointing position 23 is displayed on the display coordinate origin 20 (step S14).

[0051] As such, one or a plurality n of relay locations are set between a first pointing position 23 and the origin 20, the bird' s-eye view 21a to 21d forms in which these relay locations are each scrolled to the display coordinate origin 20 are sequentially displayed, whereby, in going from a current position to a location corresponding to the pointed to position 23 marked as being near where a destination lies, an operator can intuitively recognize how geography along the way changes.

[0052] Note that in this third embodiment, the number n of relay locations is not particularly limited, and may be a fixed number of one or a plurality, and may be variably set depending on a distance in terms of display coordinates from the origin 20 to the pointing position 23. In addition, the method of connection between the origin 20 and the pointing position 23 is likewise not limited to a straight line, and may be an appropriate curved line.

[0053] Furthermore, in the above third embodiment, the map display of the display means 12 is in a bird' s-eye view form, however, this may also be in a display form in which the coordinate origin 20 is set to the center of the display screen such as in the second embodiment shown in FIGS. 5 and 6.

[0054] Next, the fourth embodiment of the present invention will be described based on FIGS. 10 to 13. Characteristics of this fourth embodiment include, as processing functions executed by the computer 14, an area determining part 110 and a map rotating part 111 in addition to those of the third embodiment shown in FIG. 7. When an operator points to any point in a bird' s-eye view displayed by the display means 12, the area determining part 110 determines whether the pointing position belongs to a rotating area, and when the area determining part 110 determines that the pointing position does belong to a rotating area, the map rotating part 111 is the part that performs the process of rotating a map displayed on the screen.

[0055] Next, the actions of the navigation system having the above configuration will be described. In a state wherein the bird' s-eye view 21 is displayed having a current position on the screen of the display means 12 at the display coordinate

origin 20, when the operator marks near where the destination headed to lies and points thereto via the pointing means 13, the coordinate inverting part 15 converts the display coordinates of the pointing position 23 to coordinates in the map information.

[0056] Furthermore, the area determining part 110 determines whether map coordinates corresponding to the pointing position 23 belong to a rotating area 29 (step S21 in the flowchart in FIG. 11). This rotating area 29, viewed from the display coordinate origin 20, requires a directional rotation of the automobile on the screen map when on a lower side, that is when lying towards the south, however, once the direction rotates, the southern direction serves as the traveling direction, so by displaying this direction as upward on the display screen, the map display of the display means 12 and the direction in which the operator is advancing match, which is so that the map information is intuitively understood.

[0057] Furthermore, now, when it is determined that the pointing position 23 belongs to the rotating area 29 as shown in FIG. 12, the map rotating part 111 rotates the map information only a predetermined angle. That is, an angle of rotation required to rotate and display a traveling direction on a road that the automobile of the operator is headed down such that the traveling direction comes from the top of the screen in the display is precisely calculated (step S22).

[0058] Next, in the relay location setting part 19, a straight line 27 is connected between the display coordinate origin 20 and the pointing position 23 in the bird' s-eye view 21 shown in FIG. 12, and a predetermined number of relay locations, for example, the relay location 27A and 27B, are provided on this straight line 27.

[0059] Furthermore, hereinafter, the processes of steps S13 to S18 in the flowchart in FIG. 8 shown for the processing procedure of the third embodiment follow, sequential scrolling such as shown in FIG. 13(a) to (c) is performed so that the locations on the map respectively corresponding to the relay locations 27A and 27B and the pointing position 23 are displayed at the position of the display coordinate origin 20, and bird' s-eye views 21ra to 21rc in a state wherein the map is rotated by exactly the angle of rotation calculated by the map rotating part 111 are drawn out.

[0060] As a result, the location on the map

corresponding to the pointing position 23 is ultimately scrolled to the display coordinate origin 20 on the screen, and the bird's-eye view 21rc formed by rotating exactly the angle of rotation obtained by the map rotating part 111. Thereby, the region peripheral to the location on the map corresponding to the original pointing position 23 is displayed in a most enlarged form, allowing an operator to read the destination 24 in the enlarged map from the bird's-eye view 21rc and accurately perform a setting operation.

[0061] Note that likewise in this fourth embodiment, similarly to the third embodiment, the n number of relay locations is not particularly limited, and the method of connection between the origin 20 and the pointing position 23 is not limited to a straight line, and may be an appropriate curved line. Furthermore, the map display of the display means 12 is in a bird's-eye view form, however, this may also be in a display form in which the coordinate origin 20 is set to the center of the display screen such as in the second embodiment shown in FIGS. 5 and 6.

[0062] Next, the fifth embodiment of the present invention will be described based on FIGS. 14 to 16. As illustrated in FIG. 16, characteristics of this fifth embodiment include a destination-set area 210 being set on the display screen of the display means 12 in advance, and recognizing and recording-when any point 23 within range of this destination-set area 210 is pointed to-this pointing position 23 as a destination, with functions otherwise being the same as those in the third embodiment shown in FIG. 7. Furthermore, to realize this fifth embodiment, the computer 14 includes, as additional functions, an area determining part 112 for determining whether the pointing position 23 is within the destination-set area 210, and a destination setting part 113 for setting this pointing position as a destination when a position within the destination-set area 210 is pointed to.

[0063] Therefore, in the fifth embodiment, if an operator points to any point via the pointing means 13 in a state wherein a map is displayed in the bird's-eye view 21 form on the display means 12 as shown in FIG. 16, the coordinate inverting part 15 inverts the display coordinates of this pointing position 23 to coordinates on the map, and the area determining part 112 determines whether the display coordinates of the pointing position 23 are within

the destination-set area 210 (step S31 in the flowchart in FIG. 15).

[0064] Here, if the position 23 within the destination-set area 210 is pointed to, the destination setting part 112 sets the location on the map corresponding to the pointing position 23 as the destination (step S32).

[0065] However, if the pointing position is out of range of the destination-set area 210, the processes of steps S13 to S18 in the flowchart in FIG. 8 are repeatedly executed by the relay location setting part 19, the coordinate origin setting part 16, the display coordinates part 17, the coordinate converting part 18, and the coordinate inverting part 15, as in the third embodiment, and the bird's-eye views 21a to 21d-formed by scrolling on the display coordinate origin 20 the locations on the map respectively corresponding to the relay locations 27A and 27B and pointing position 23 set between the first pointing position 23 and the origin 20-are sequentially displayed as shown in FIG. 9(a) to (d), and in going from the location on the map corresponding to the first origin 20 to the location on the map corresponding to the pointed to position 23 marked as being near where a destination lies, an operator can intuitively recognize how geography changes along the way changes.

[0066] According to this fifth embodiment, in cases such as when a destination is comparatively near a current position and lies within the destination-set area 210 on the map 21 in the bird's-eye view form displayed on the display means 12, one operation of pointing to this destination can be used to automatically set the destination, and moreover, if the destination is separated far from the origin 20 and is out of range of the destination-set area 210, with just one instance of pointing to a corresponding position near this destination, scrolling can be performed such that the pointing position comes to the display coordinate origin and is displayed in an enlarged state, allowing an operator to accurately determine and set the destination.

[0067] Note that in this fifth embodiment, similarly to the third embodiment, a relay location is set automatically and scrolling is displayed in a step-wise manner, however, this function is not necessary in particular, and if the pointing position 23 is out of range of the destination-set area 210, scrolling to the pointing position may be done all

at once, as in the first embodiment.

[0068] In addition, the form of the map displayed by the display means 12 is not limited to a bird's-eye view, and may be in a display form such as that shown in FIGS. 5 and 6 for the second embodiment.

[Brief Description of Drawings]

[FIG. 1] is a functional block diagram of the first embodiment of the present invention.

[FIG. 2] is a flowchart of the map display process according to the above embodiment.

[FIG. 3] is an explanatory diagram of a display state of a map according to the above embodiment.

[FIG. 4] is an explanatory diagram showing the scrolling process of a map according to the above embodiment.

[FIG. 5] is an explanatory diagram of a display state of a map according to the second embodiment of the present invention.

[FIG. 6] is an explanatory diagram showing the map scrolling process according to the above embodiment.

[FIG. 7] is a functional block diagram of the third embodiment of the present invention.

[FIG. 8] is a flowchart of the map display process according to the above embodiment.

[FIG. 9] is an explanatory diagram showing the map scrolling process according to the above embodiment.

[FIG. 10] is a functional block diagram of the fourth embodiment of the present invention.

[FIG. 11] is a flowchart of the map rotation process of the above embodiment.

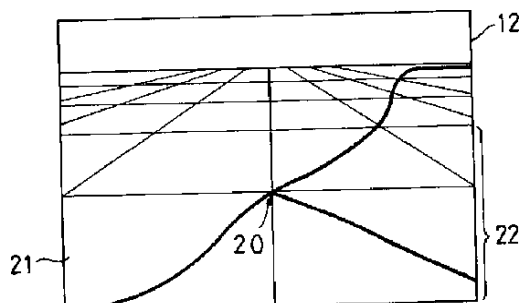
[FIG. 12] is an explanatory diagram of a display state of a map according to the above embodiment.

[FIG. 13] is an explanatory diagram showing the map rotation and scrolling processes according to the above embodiment.

[FIG. 14] is a functional block diagram of the fifth embodiment of the present invention.

[FIG. 15] is a flowchart of the destination setting process according to the above embodiment.

[FIG. 3]



[FIG. 16] is an explanatory diagram of a display state of a map according to the above embodiment.

[FIG. 17] is an explanatory diagram showing the scrolling screen of a map in a conventional example.

[FIG. 18] is an explanatory diagram showing the scrolling screen of a map in another conventional example.

[Description of Reference Numerals]

11 Map information storage means

12 Display means

13 Pointing means

14 Computer

15 Coordinate inverting part

16 Coordinate origin setting part

17 Display coordinates part

18 Coordinate converting part

19 Relay location setting part

110 Area determining part

111 Map rotating part

112 Area determining part

113 Destination setting part

20 Origin

21, 21' Bird's-eye view

21a to 21d Bird's-eye view

21ra to 21rc Bird's-eye view

23 Pointing position

24 Destination

25, 25' Map

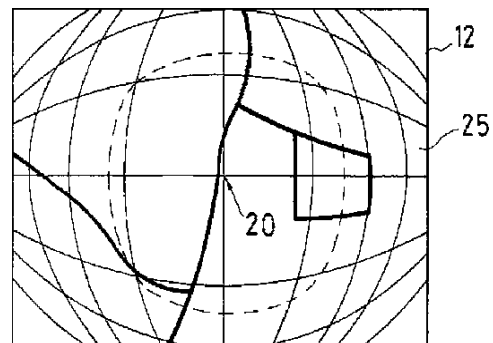
27 Straight line

27A, 27B Relay location

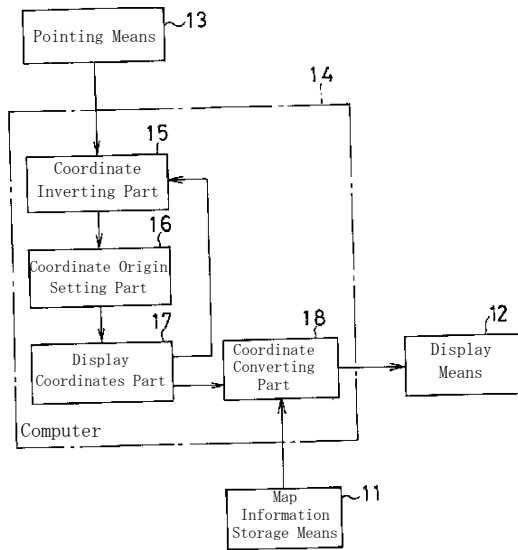
29 Rotating area

210 Destination-set area

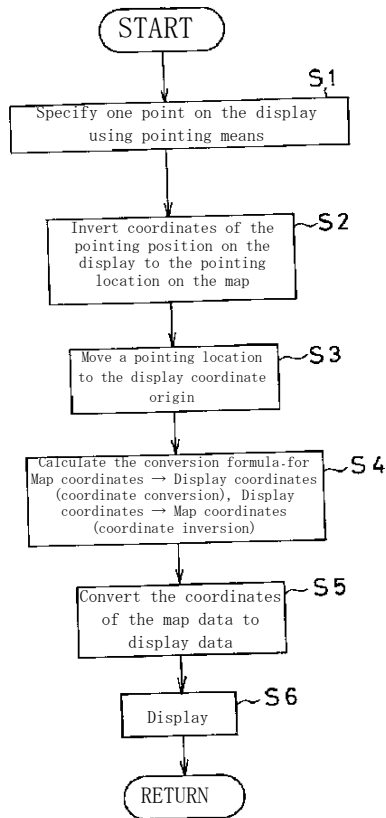
[FIG. 5]



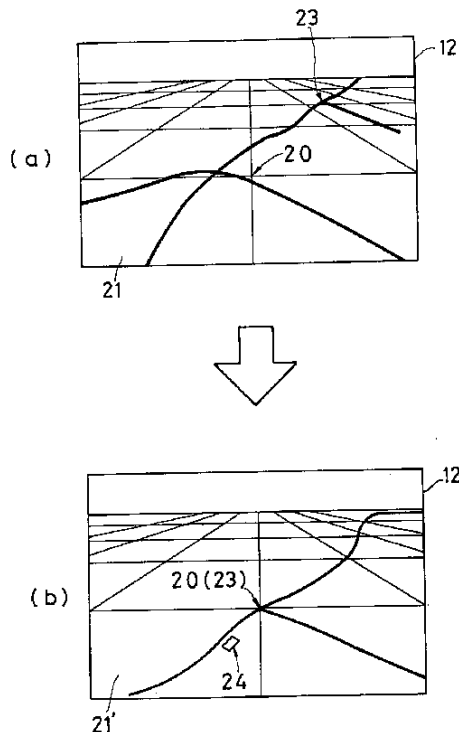
[FIG. 1]



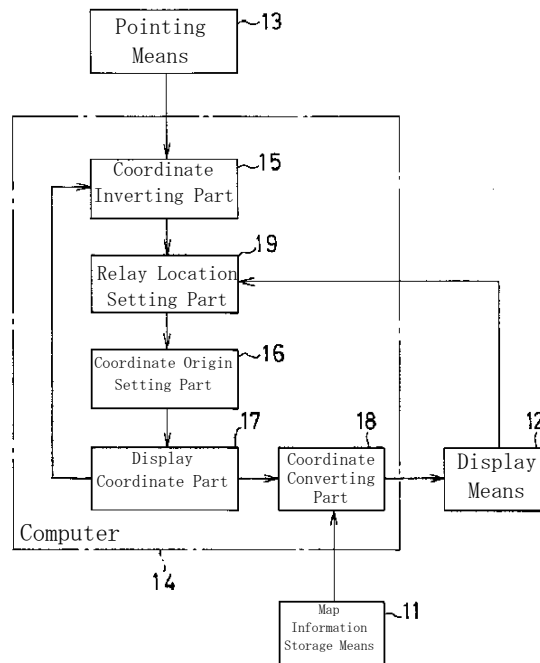
[FIG. 2]



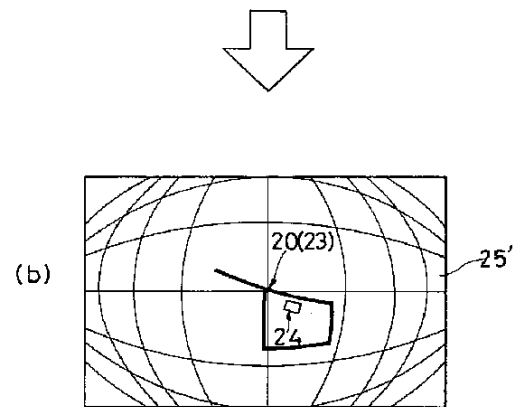
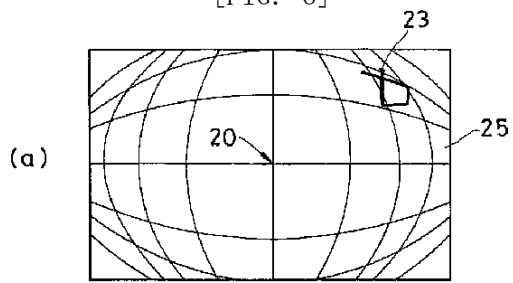
[FIG. 4]



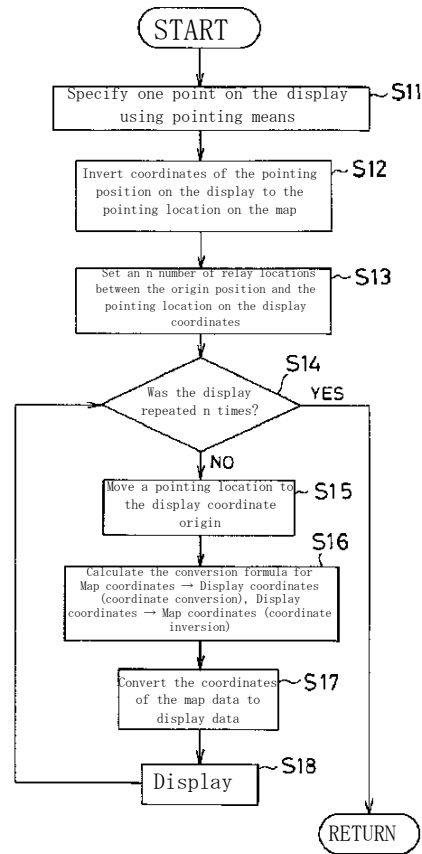
[FIG. 7]



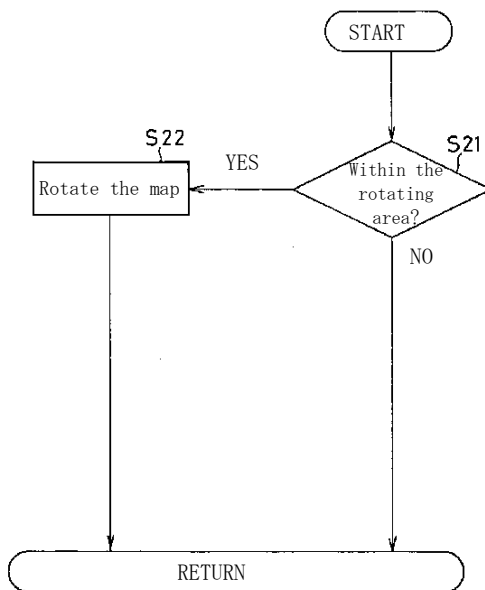
[FIG. 6]



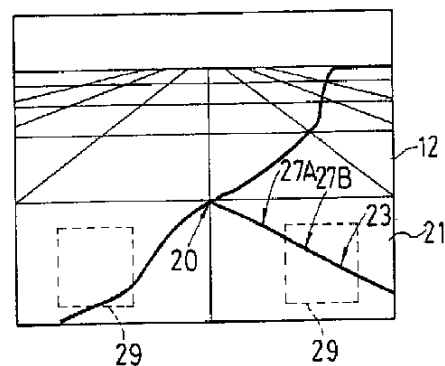
[FIG. 8]



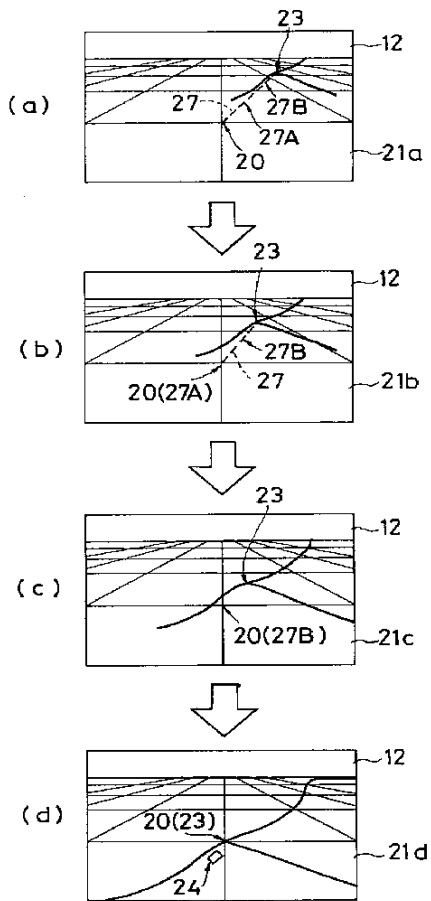
[FIG. 11]



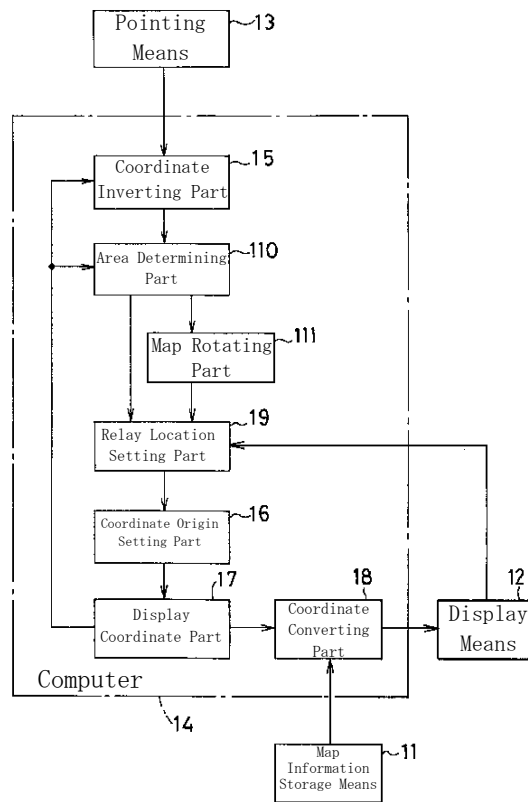
[FIG. 12]



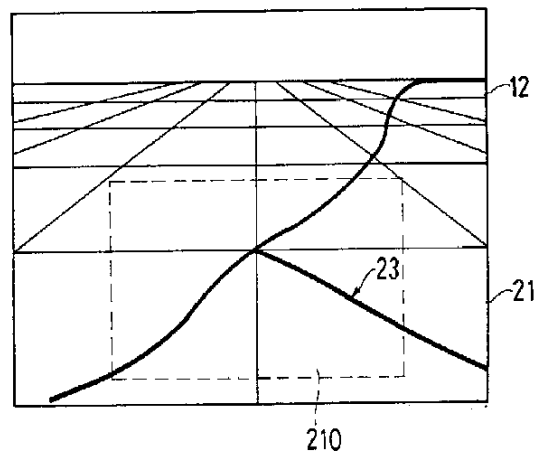
[FIG. 9]



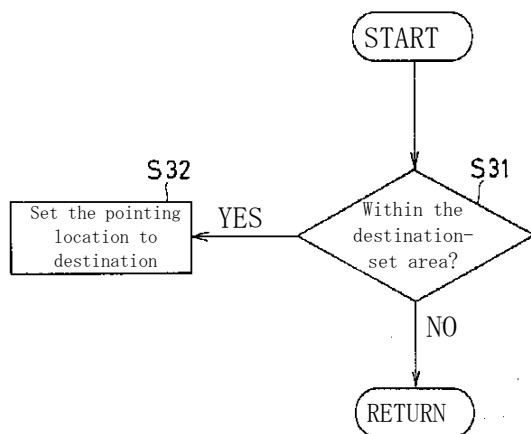
[FIG. 10]



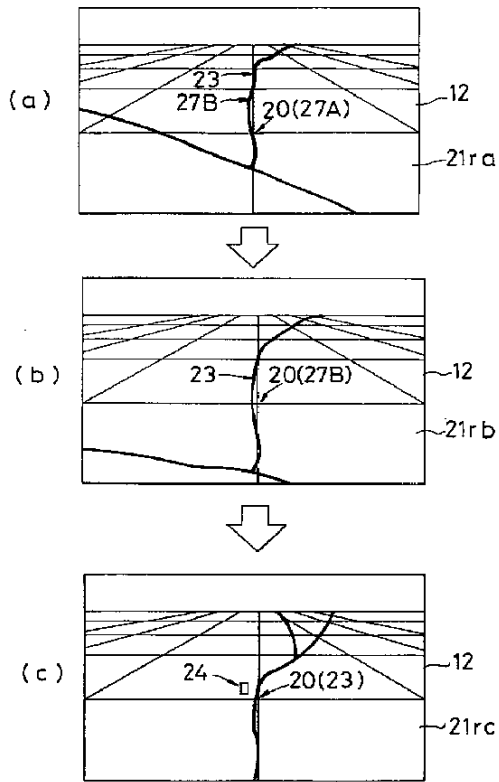
[FIG. 16]



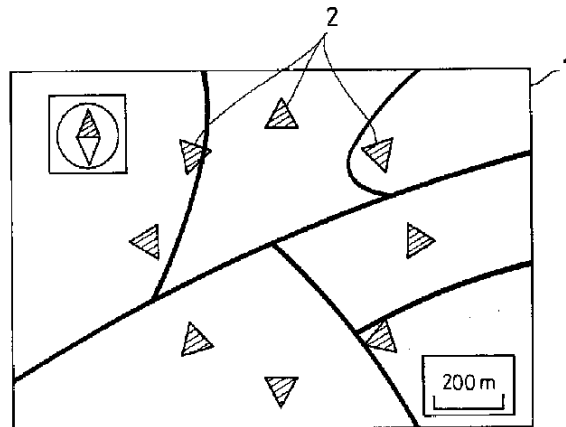
[FIG. 15]



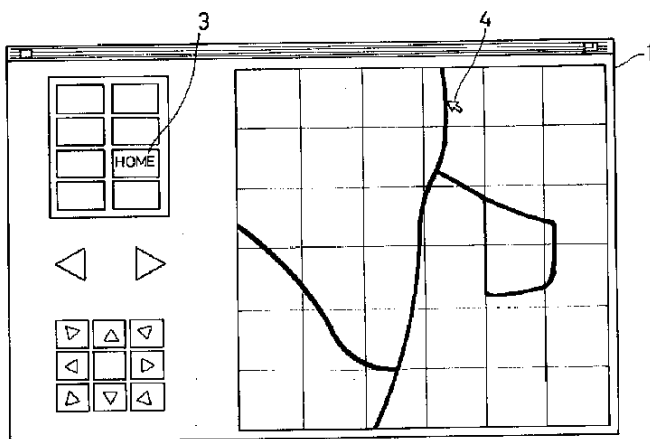
[FIG. 13]



[FIG. 17]



[FIG. 18]



[FIG. 14]

