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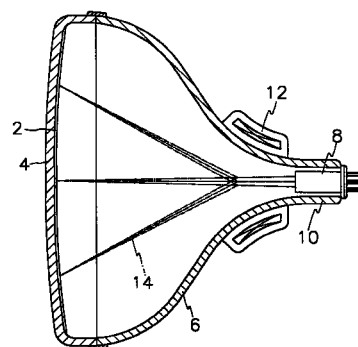
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(54) **Cathode ray tube**

(57) A cathode ray tube includes a faceplate panel with an effective screen portion. The effective screen portion of the panel has a horizontal length L and a vertical height H. The aspect ratio L/H of the effective screen portion satisfies the following condition: $4/3 > L/H > 16/9$. The effective screen portion of the panel is formed with a normal screen area for displaying picture image, and a separate screen area for displaying graphics or text. The normal screen area has a variable aspect ratio corresponding to an aspect ratio of 4:3 or 16:9 of a picture image to be displayed.

FIG.1



EP 1 011 124 A2

Description**BACKGROUND OF THE INVENTION****(a) Field of the Invention**

[0001] The present invention relates to a cathode ray tube (CRT) and, more particularly, to a CRT which is adapted for the use in multi-media display applications.

(b) Description of the Related Art

[0002] Generally, CRTs for the multi-media display use are designed to allow users to control and manipulate sound, video, text and graphics. For expository convenience, the CRT for the multi-media display use will be hereinafter referred to simply as the "multimedia CRT".

[0003] It is necessary that such a multimedia CRT should be provided with a separate screen area for displaying graphics or text.

[0004] Meanwhile, the ratio of the width or length of a television picture image to the height (called the "aspect ratio") is internationally standardized to be 4:3 or 16:9. Correspondingly, the effective screen of the CRT where picture images are actually displayed is determined to have an aspect ratio of 4:3 or 16:9.

[0005] In order to allocate the separate screen area in the above-structured CRT, it is inevitable that the normal screen area for displaying picture images should be partially intercepted by the separate screen area. Furthermore, since the effective screen of such a CRT is determined to have either one of the aspect ratios of 4:3 and 16:9, it follows that the picture image should be distorted or reduced when the CRT having the aspect ratio of 4:3 displays the picture image having the aspect ratio of 16:9 or to the contrary.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a multimedia CRT which can simultaneously display picture images and graphics or text without involving any image distortion.

[0007] It is another object of the present invention to provide a multimedia CRT which has a variable aspect ratio corresponding to different aspect ratios of a picture image to be displayed.

[0008] This and other objects may be achieved by a cathode ray tube including a faceplate panel with an effective screen portion. The effective screen portion of the panel has a horizontal length L and a vertical height H. The aspect ratio L/H of the effective screen portion satisfies the following condition: $4/3 > L/H > 16/9$. The effective screen portion of the panel is formed with a normal screen area for displaying picture image, and a separate screen area for displaying graphics or text. The normal screen area has a variable aspect ratio corresponding to an aspect ratio of 4:3 or 16:9 of a picture image to be displayed.

[0009] Particularly, the effective screen portion of the panel may have an aspect ratio of 32:21 or 14:9.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or the similar components, wherein:

Fig. 1 is a sectional view of a CRT with a faceplate panel according to a preferred embodiment of the present invention;

Fig. 2 is a front view of the panel with a separate screen area, shown in Fig. 1;

Fig. 3 is a front view of the panel with another separate screen area, shown in Fig. 1;

Fig. 4 is a schematic view illustrating the separate screen area shown in Fig. 2;

Fig. 5 is a schematic view illustrating the separate screen area shown in Fig. 3;

Fig. 6 is a front view of the panel with one arrangement of iconic menu bars, shown in Fig. 1;

Fig. 7 is a front view of the panel with another arrangement of iconic menu bars, shown in Fig. 1;

Fig. 8 is a front view of the panel with a text of characters, shown in Fig. 1; and

Fig. 9 is a front view of the panel with another text of characters, shown in Fig. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] Preferred embodiments of this invention will be explained with reference to the accompanying drawings.

[0012] Fig. 1 is a partial sectional view of a CRT with a faceplate panel 4 according to a preferred embodiment of the present invention, and Figs. 2 and 3 illustrate the panel 4 shown in Fig. 1.

[0013] As shown in Fig. 1, the panel 4 has an inner phosphor screen 2 and a rear portion, and a funnel 6 is connected to the rear portion of the panel 4. A neck 10 having an electron gun 8 is sealed to the funnel 10. A deflection yoke 12 is mounted around the funnel 10. In operation, electron beams 14 are emitted from the electron gun 8, and horizontally and vertically deflected under the influence of deflection magnetic fields from the deflection yoke 12. The electron beams 14 finally land on phosphors on the phosphor screen 2 to thereby produce the desired display image.

[0014] As shown in Figs. 2 and 3, the panel 4 has an effective screen portion 16 that approximately corresponds to the area of the phosphor screen 2. The effective screen portion 16 is in turn formed with a normal screen area 18 for displaying picture images and a separate screen area 20 for displaying graphics or text.

[0015] In order to display screen images on the normal screen area 18 and the separate screen area 20 without involving any image distortion, the aspect ratio L/H of the effective screen portion 16 should be established to satisfy the mathematical formula 1.

$$4/3 > L/H > 16/9$$

Mathematical formula 1

[0016] The positional and dimensional relations of the normal screen area 18 to the separate screen area 20 may be changed in accordance with varying aspect ratios of the picture image to be displayed.

[0017] For example, as shown in Fig. 2, the normal screen area 18 and the separate screen area 20 are arranged to be vertically parallel to each other when the aspect ratio of the picture image to be displayed is 4:3. This arrangement will be hereinafter referred to as the first mode. In the first mode, the aspect ratio of the normal screen area 18 is also established to be 4:3.

[0018] Furthermore, as shown in Fig. 3, the normal screen area 18 and the separate screen area 20 are arranged to be horizontally parallel to each other when the aspect ratio of the picture image to be displayed is 16:9. The arrangement will be hereinafter referred to as the second mode. In the second mode, the aspect ratio of the normal screen area 18 is also established to be 16:9.

[0019] Figs. 4 and 5 illustrate the effective screen portion 16 in the first and second modes, respectively. In the first mode, as shown in Fig. 4, the horizontal length of the normal screen area 18 is assumed to be 4X, and the vertical height to be 3X. The separate screen area 20 is formed with m numbers of function menu bars, and each function menu bar is assumed to have an aspect ratio of w:h.

[0020] In the second mode, as shown in Fig. 5, the horizontal length of the normal screen area 18 is assumed to be 16Y, and the vertical height to be 9Y. The separate screen area 20 is formed with n numbers of function menu bars, and each function menu bar is assumed to have an aspect ratio of w:h.

[0021] First, assume that the aspect ratio w:h of each function menu bar is 4:3. In this case, the horizontal length L and vertical height H of the effective screen portion 16 can be expressed by the mathematical formulas 2 and 3.

$$L = w + 4X = 16Y = n \times w$$

Mathematical formula 2

$$H = m \times h = 9Y + h = 3X$$

Mathematical formula 3

[0022] Furthermore, the mathematical formulas 4 and 5 are derived from the mathematical formula 2, and the mathematical formulas 6 and 7 from the mathematical formula 3.

$$Y = (4X + w)/16$$

Mathematical formula 4

$$X = (n-1)w/4$$

Mathematical formula 5

$$Y = (3X - h)/9$$

Mathematical formula 6

$$X = mh/3$$

Mathematical formula 7

[0023] Since the aspect ratio w:h of each function menu bar is 4:3, the horizontal length w of the function menu bar may be expressed by the mathematical formula 8.

$$w = 4h/3$$

Mathematical formula 8

[0024] The mathematical formula 9 is derived from the mathematical formulas 4 and 6, and the mathematical formula 10 from the mathematical formulas 8 and 9.

$$(4X+w)/16 = (3X-h)/9$$

Mathematical formula 9

$$X = 7h/3$$

Mathematical formula 10

[0025] It can be derived from the mathematical formulas 7 and 10 that the number m of the function menu bars in the first mode is 7. In the same manner, it can be derived from the mathematical formulas 5, 8 and 10 that the number n of the function menu bars in the second mode is 8.

[0026] Therefore, the aspect ratio L:H of the effective screen portion 16 may be expressed by the mathematical formula 11.

$$L:H = (n \times w):(m \times h) = 8(4h/3):7h = 32:21$$

Mathematical formula 11

[0027] Accordingly, in case the aspect ratio w:h of each function menu bar is established to be 4:3, the aspect ratio L:H of the effective screen portion 16 is preferably determined to be 32:21 while satisfying the mathematical formula 1.

[0028] Furthermore, since the number m of the function menu bars in the first mode is 7 and the number n of the function menu bars in the second mode is 8, it follows that the aspect ratio of the separate screen area 20 in the first mode is 21:4 and the aspect ratio of the separate screen area 20 in the second mode is 32:3.

[0029] Second, in case the aspect ratio w:h of each function menu bar is established to be 16:9, the aspect ratio L:H of the effective screen portion 16 may be obtained in the following way.

[0030] The horizontal length w of each function menu bar may be expressed by the mathematical formula 12.

$$w = 16h/9$$

Mathematical formula 12

[0031] The mathematical formula 13 is then derived from the mathematical formulas 9 and 12.

$$X = 8h/3$$

Mathematical formula 13

[0032] It can be derived from the mathematical formulas 7 and 13 that the number m of the function menu bars in the first mode is 8. In the same manner, it can be derived from the mathematical formulas 5 and 13 that the number n of the function menu bars in the second mode is 7.

[0033] Therefore, the aspect ratio L:H of the effective screen portion 16 may be expressed by the mathematical formula 14.

$$L:H = (n \times w):(m \times h) = 7(16h/9):8h = 14:9$$

Mathematical formula 14

[0034] Accordingly, in case the aspect ratio w:h of each function menu bar is established to be 16:9, the aspect ratio L:H of the effective screen portion 16 is preferably determined to be 14:9 while satisfying the mathematical formula 1.

[0035] Furthermore, since the number m of the function menu bars in the first mode is 8 and the number n of the function menu bars in the second mode is 7, it follows that the aspect ratio of the separate screen area 20 in the first mode is 112:9 and the aspect ratio of the separate screen area 20 in the second mode is 9:2.

[0036] In the above-structured CRT, the effective screen portion 16 of the panel 4 can be easily shifted from the first mode to the second mode or to the contrary.

[0037] Figs. 6 and 7 specifically illustrate the separate screen area 20 with a plurality of iconic function menu bars in the first and second modes, respectively.

[0038] The iconic function menu bars are based on graphical user interface (GUI) techniques to allow the user to select the desired function menu. The menu selection of the user may be realized by operating a remote control or by pressing the desired menu bar with a finger. In the latter case, the panel 4 should be coated with double conductive layers while interposing a spacer between the double conductive layers. When the user presses the surface of the panel 4, the spacer is compressed and the double conductive layers contact each other so that the contact signal is transformed into an electrical signal to thereby operate the target menu.

[0039] Figs. 8 and 9 specifically illustrate the separate screen area 20 with a text of characters in the first and second modes, respectively.

[0040] The text to be displayed on the separate screen area 20 may bear all sorts of guide information or commercial notes, and the text can be displayed to be disparate or continuous.

[0041] As described above, the inventive CRT can simultaneously display picture and graphic images without any

image distortion. Furthermore, the CRT can be well adapted for displaying picture images with varying aspect ratios.

[0042] While the present invention has been described in detail with reference to the preferred embodiments, those skilled in the art will appreciate that various modifications and substitutions can be made thereto without departing from the spirit and scope of the present invention as set forth in the appended claims.

[0043] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included just for the sole purpose of increasing intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. A cathode ray tube comprising a faceplate panel with an effective screen portion, the effective screen portion of the panel having a horizontal length L and a vertical height H, the aspect ratio L/H of the effective screen portion satisfying the following condition: $4/3 > L/H > 16/9$, the effective screen portion of the panel comprising a normal screen area for displaying picture image, and a separate screen area for displaying graphics or text, the normal screen area having a variable aspect ratio corresponding to an aspect ratio of 4:3 or 16:9 of a picture image to be displayed.
2. The cathode ray tube of claim 1 wherein the separate screen area comprises a plurality of iconic function menu bars based on graphical user interface techniques.
3. The cathode ray tube of claim 2 wherein the iconic function menu bars are executed by using a remote control or by pressing a surface of the panel with a finger.
4. The cathode ray tube of claim 1 wherein the separate screen area is to display a text of characters.
5. The cathode ray tube of claim 1 wherein the normal screen area has an aspect ratio of 4:3, and the separate screen area is arranged to be vertically parallel to the normal screen area.
6. The cathode ray tube of claim 1 wherein the normal screen area has an aspect ratio of 16:9, and the separate screen area is arranged to be horizontally parallel to the normal screen area.
7. The cathode ray tube of claim 1 wherein the effective screen portion of the panel has an aspect ratio of 32:21.
8. The cathode ray tube of claim 1 wherein the effective screen portion of the panel has an aspect ratio of 14:9.

FIG.1

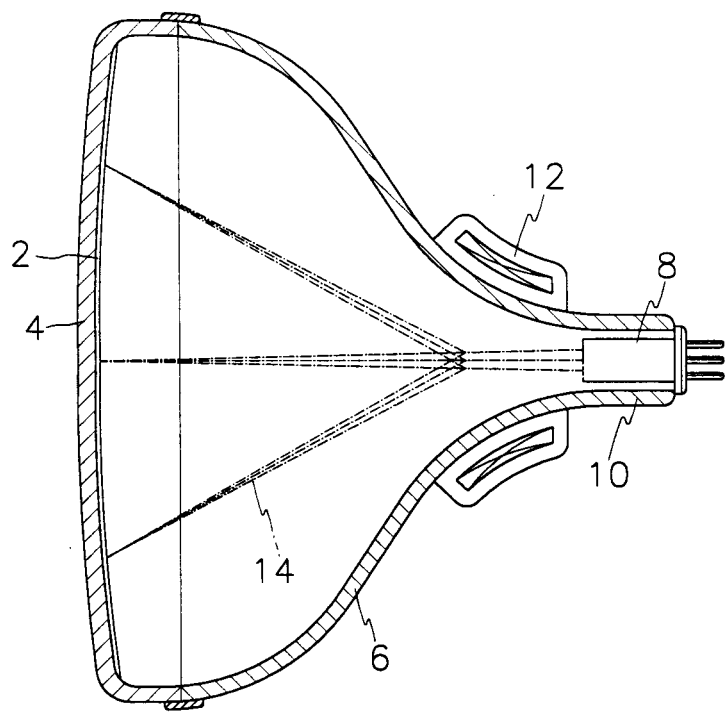


FIG.2

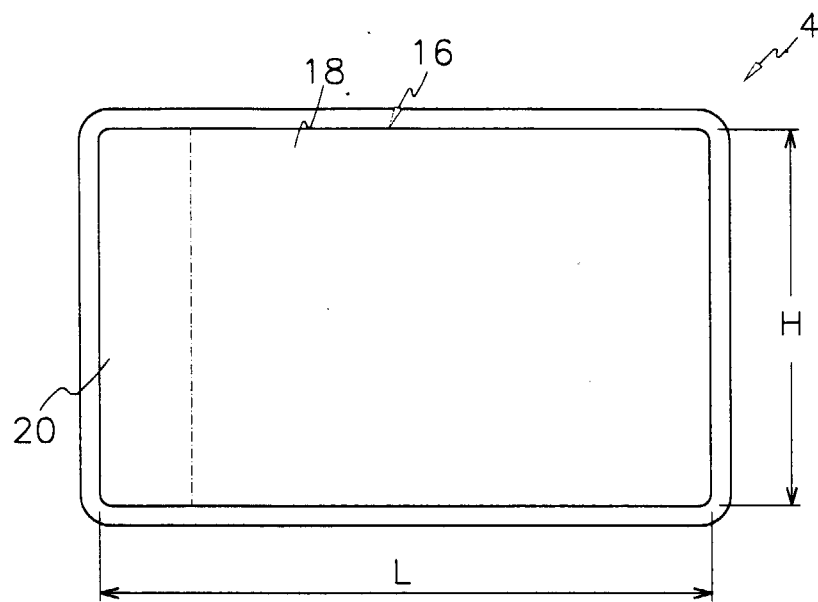


FIG.3

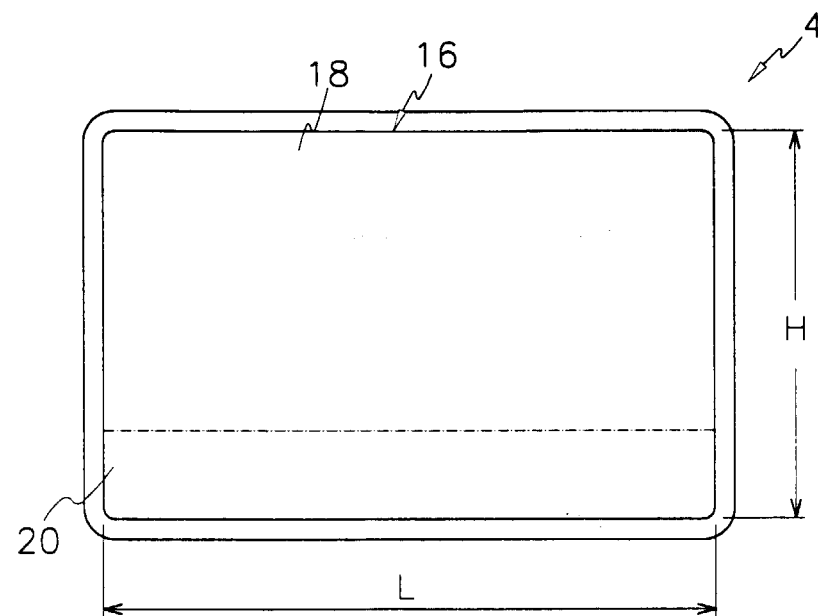


FIG.4

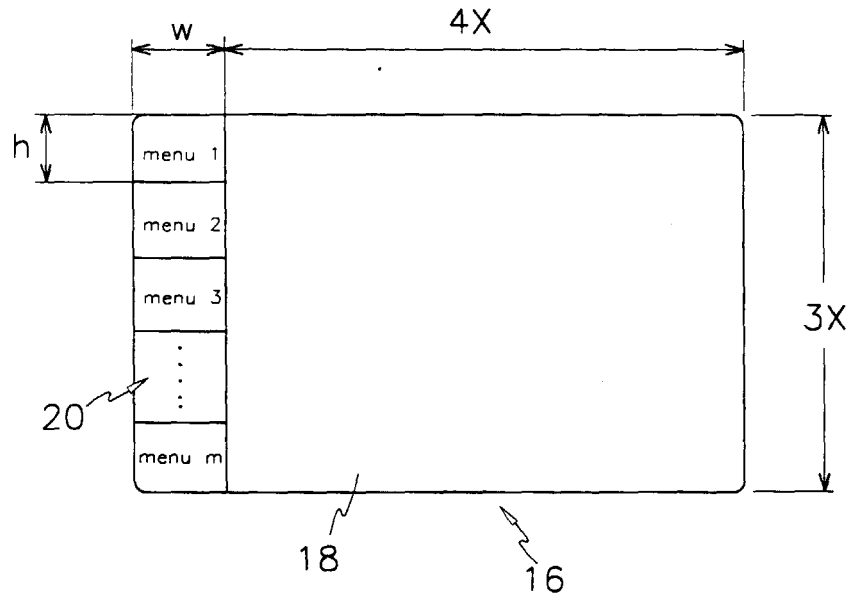


FIG.5

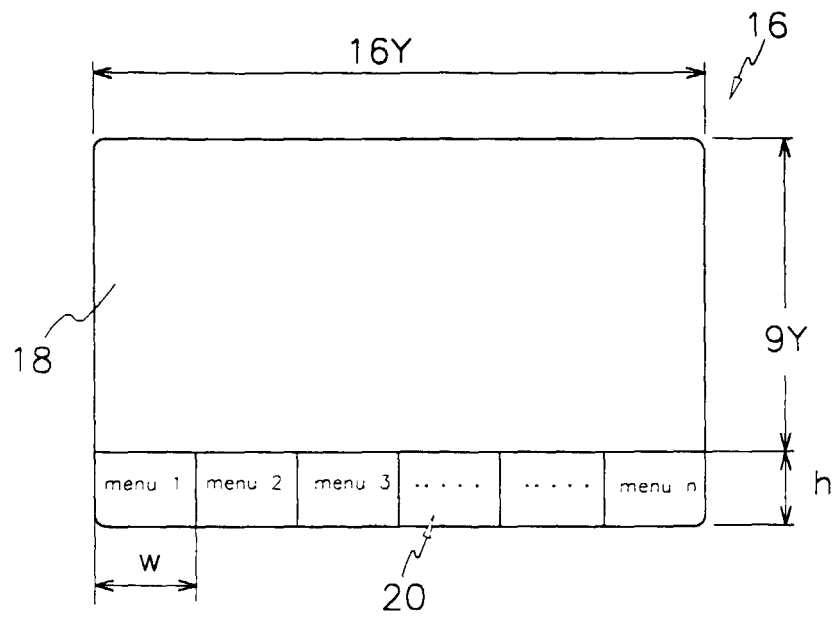


FIG.6

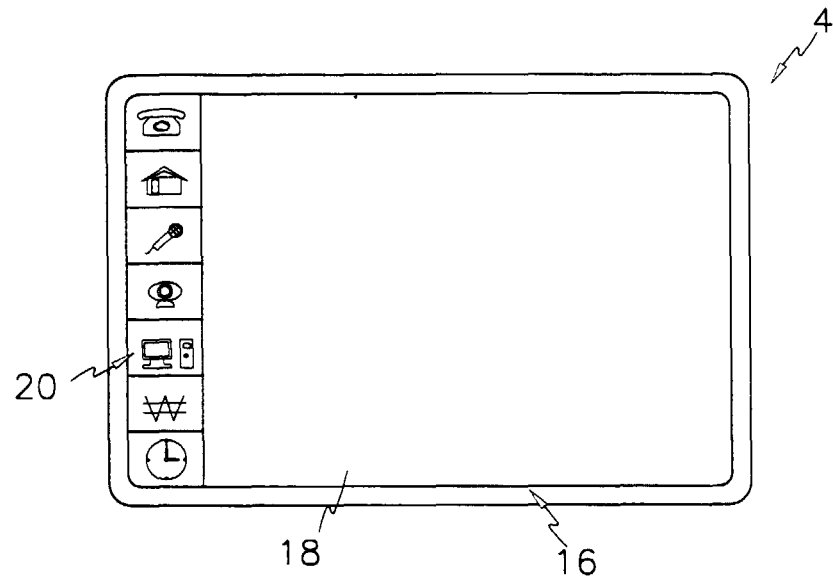


FIG.7

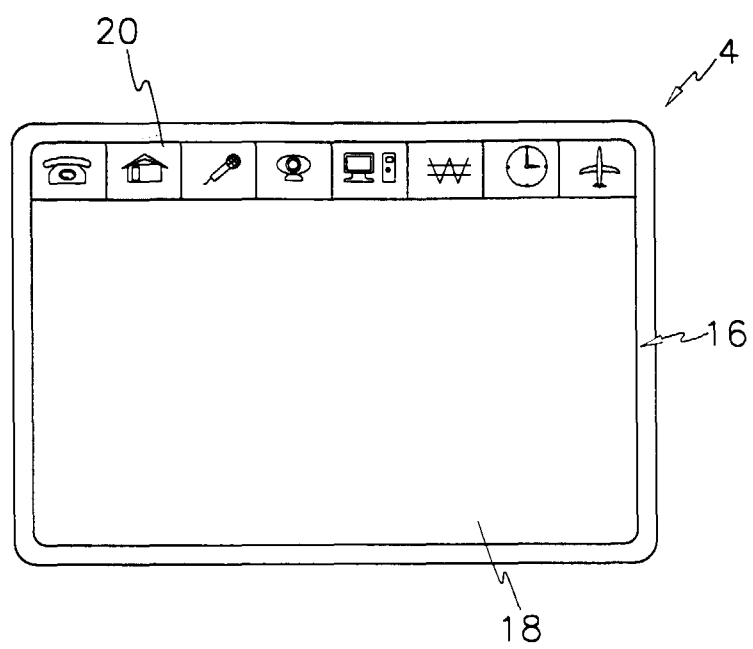


FIG.8

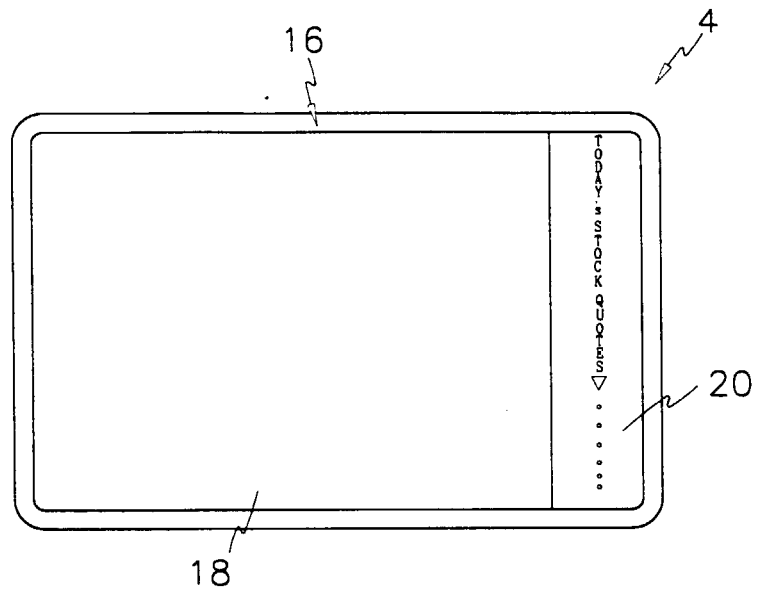


FIG.9

