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(54) **HANGING MOBILE DEVICE WITH ELECTRONIC DISPLAY**

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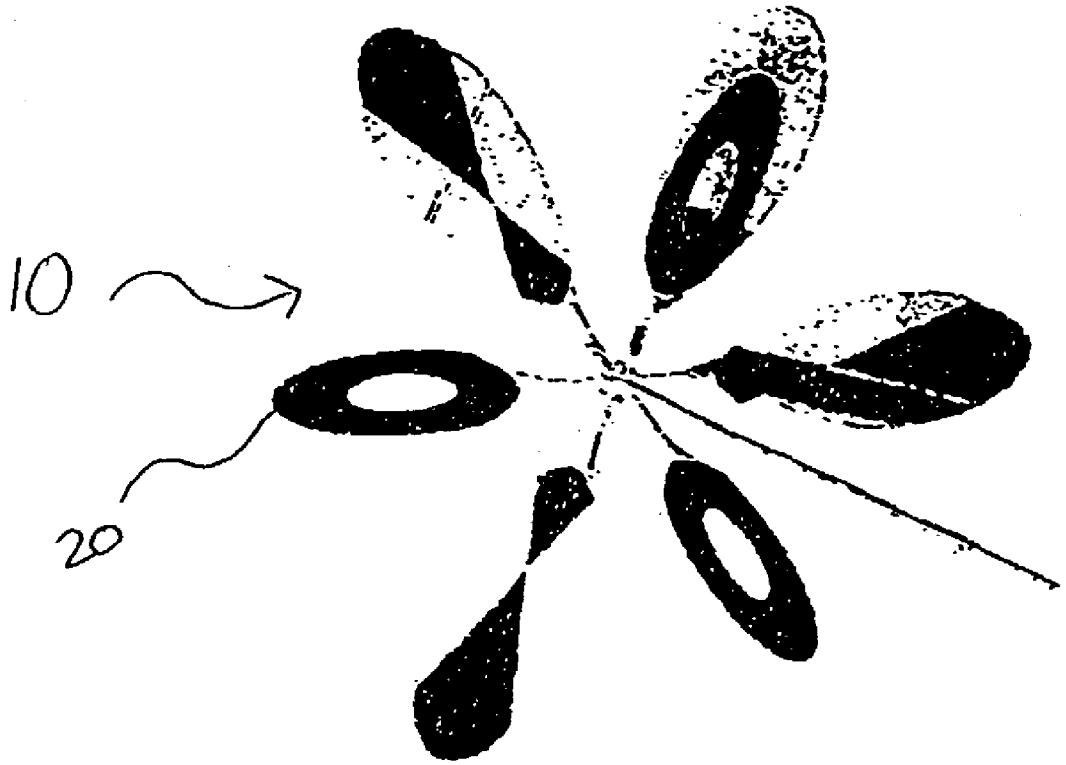
(57) **ABSTRACT**

A mobile having an electronic display is disclosed. The display is preferably a thin, flexible display such as an organic light emitting diode display. The display is coupled to a computing device. The mobile optionally includes sound output, image output, or video output. A camera or sensing device optionally service as the input for a baby monitoring system. In one preferred embodiment, the mobile is interactive, and can respond to various sensed aspects, such as sound, light, or gestures via gesture recognition.



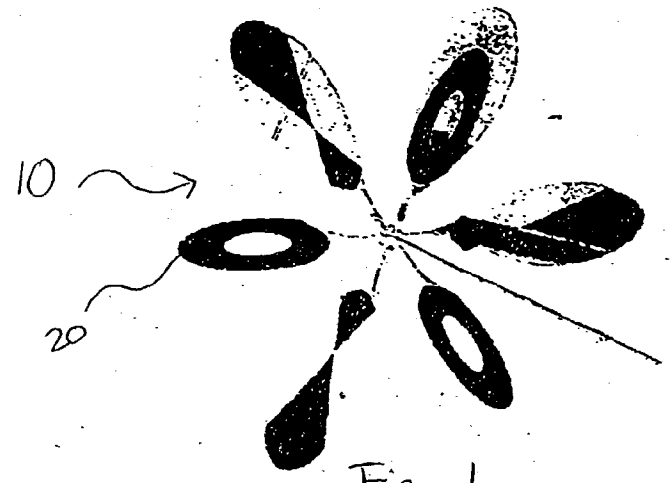


Fig. 1

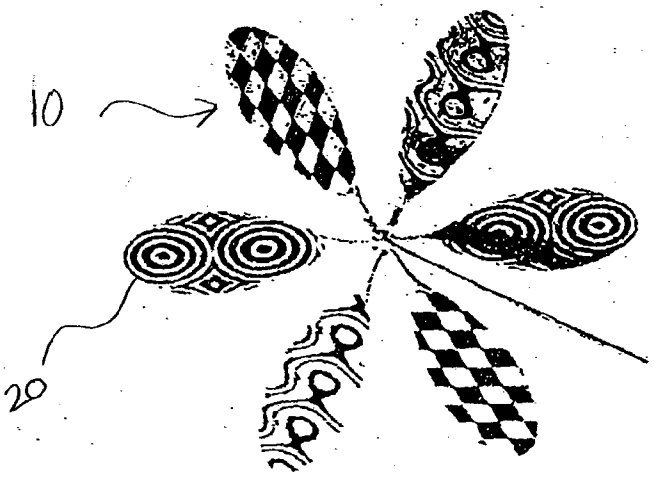


Fig. 2

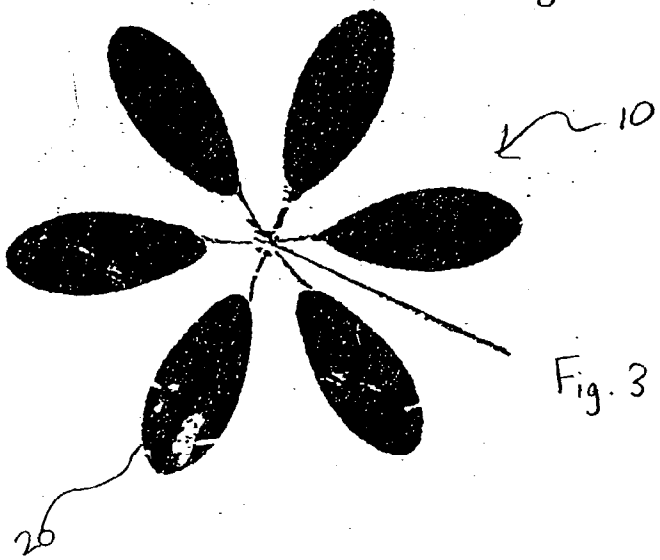


Fig. 3

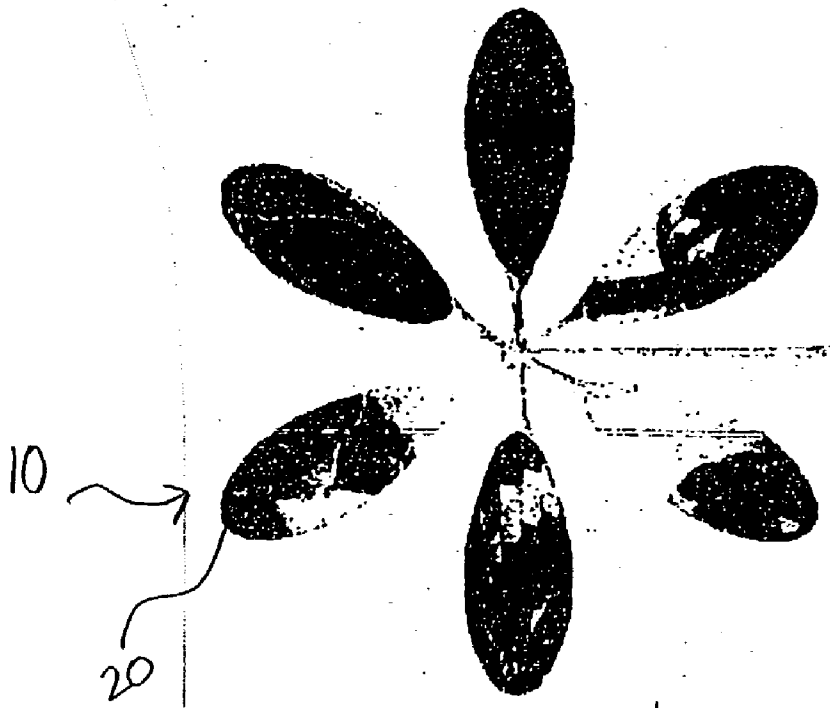


Fig. 4

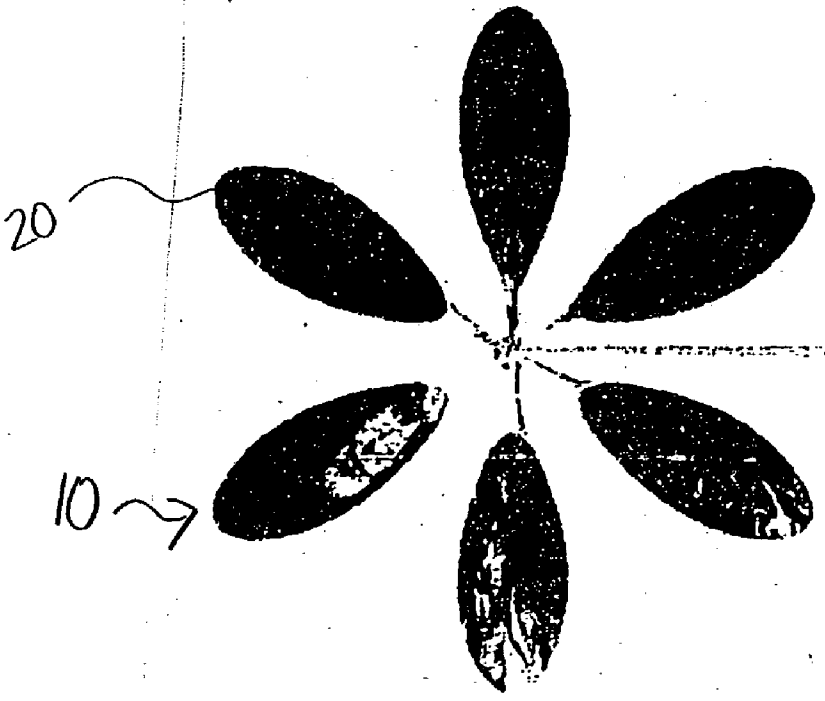


Fig. 5

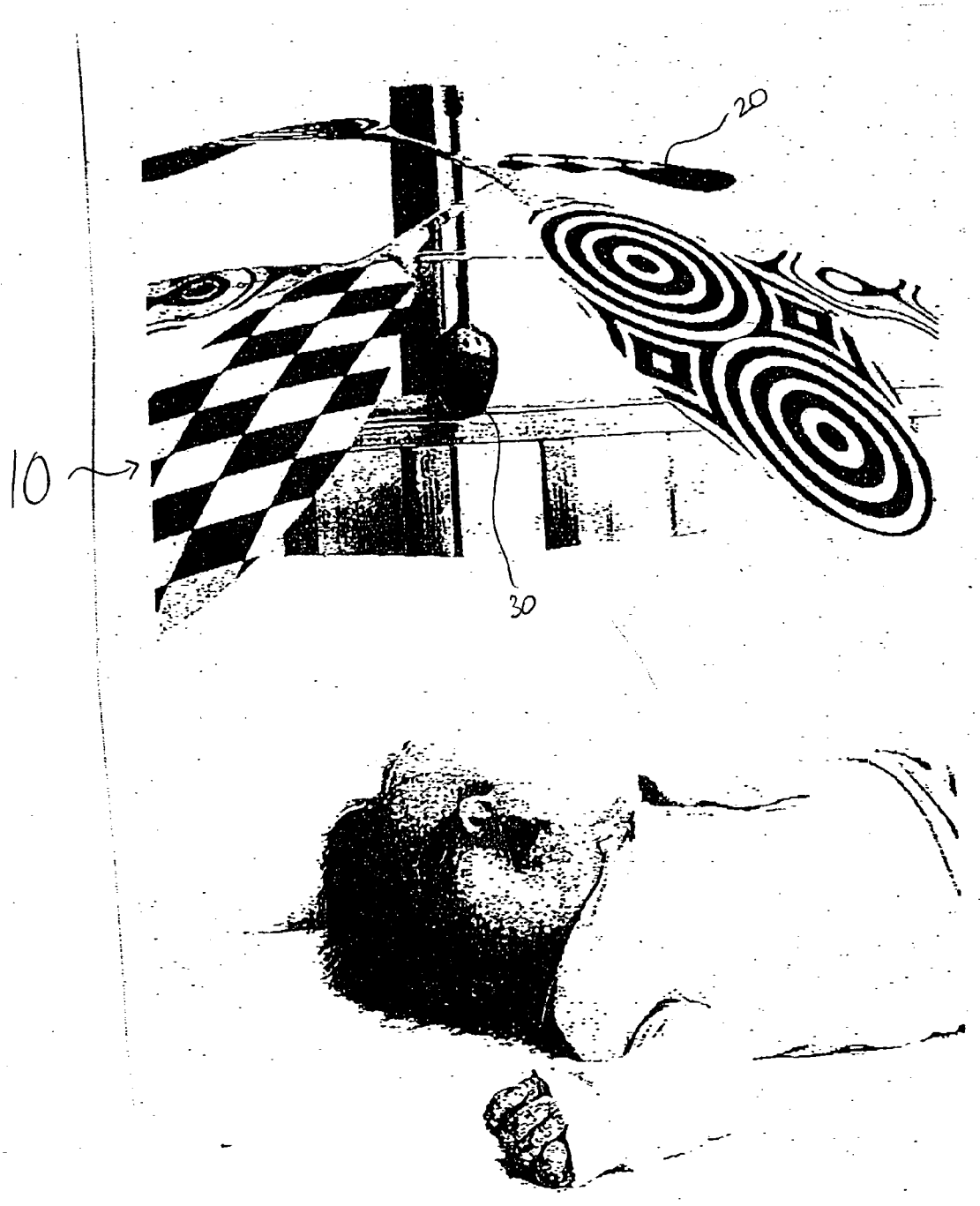


Fig. 6

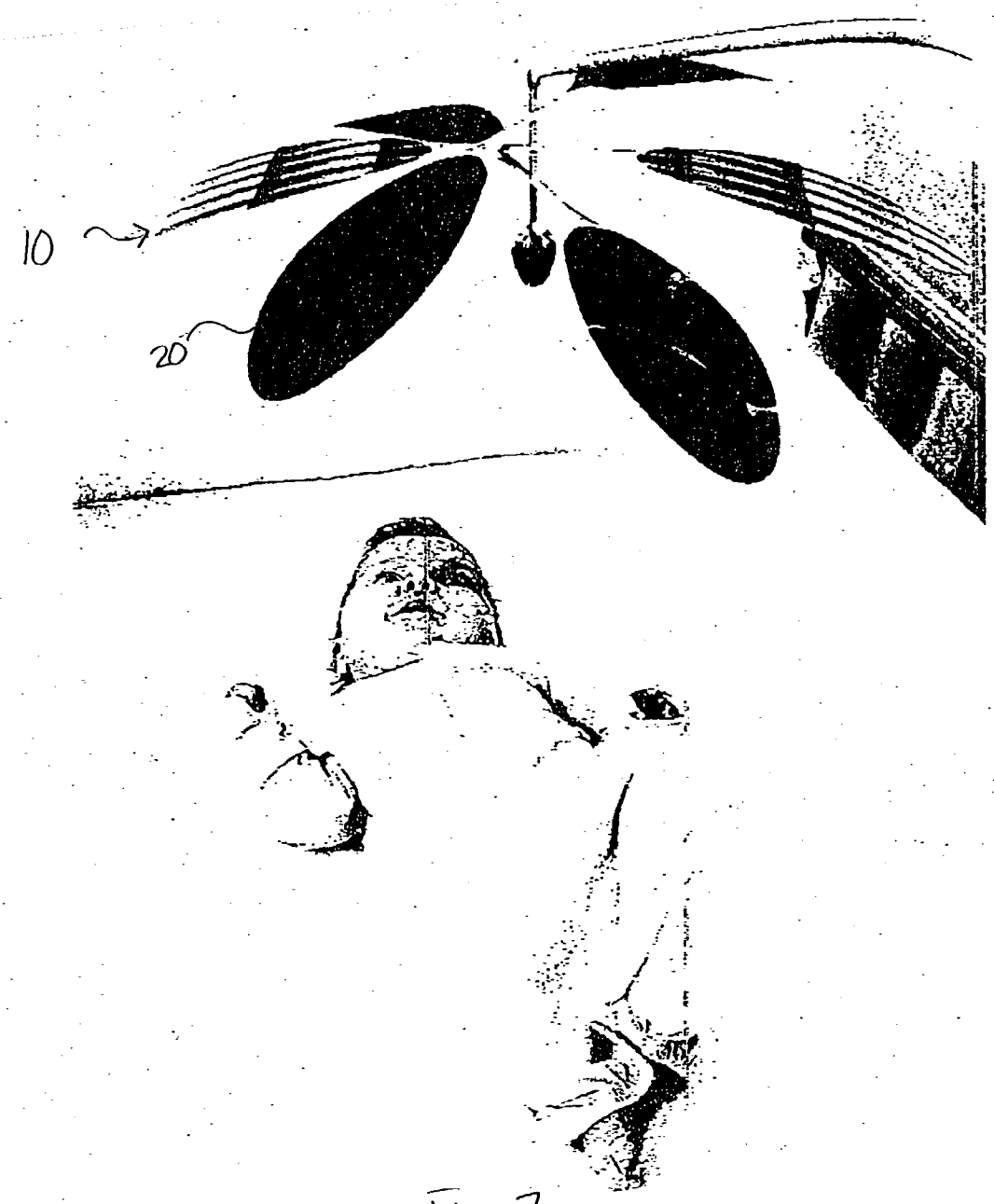


Fig. 7

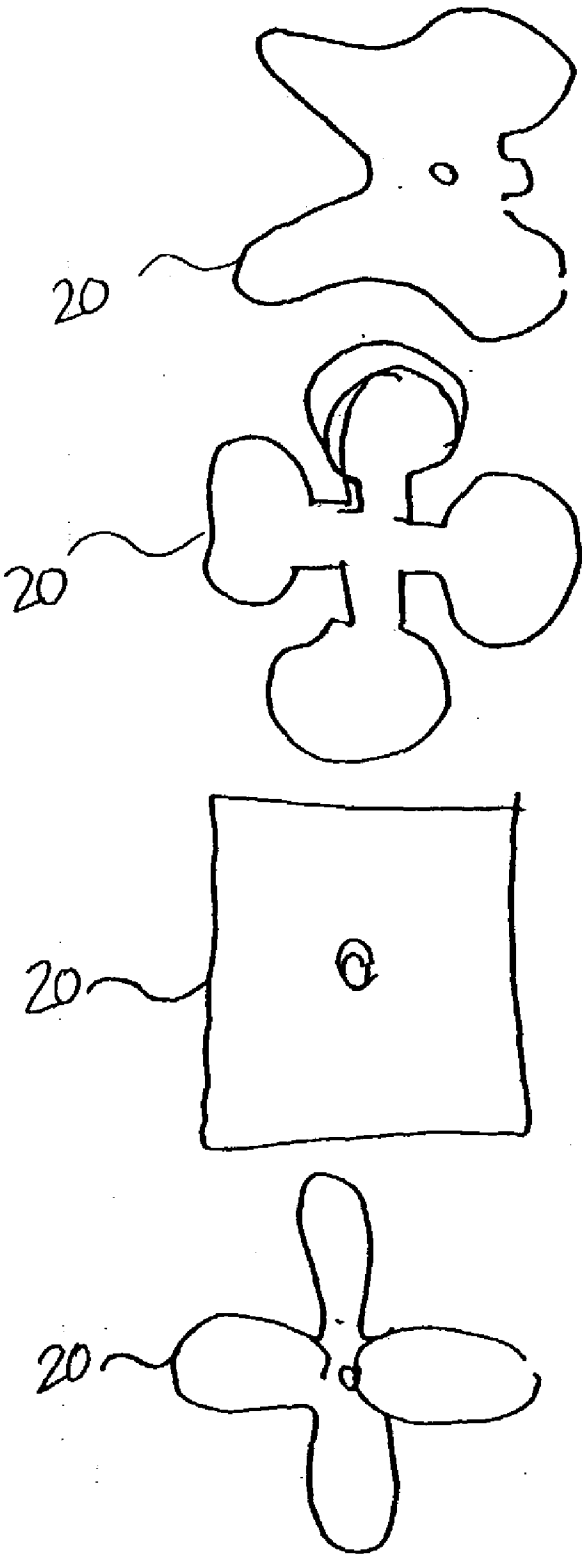


Fig. 8

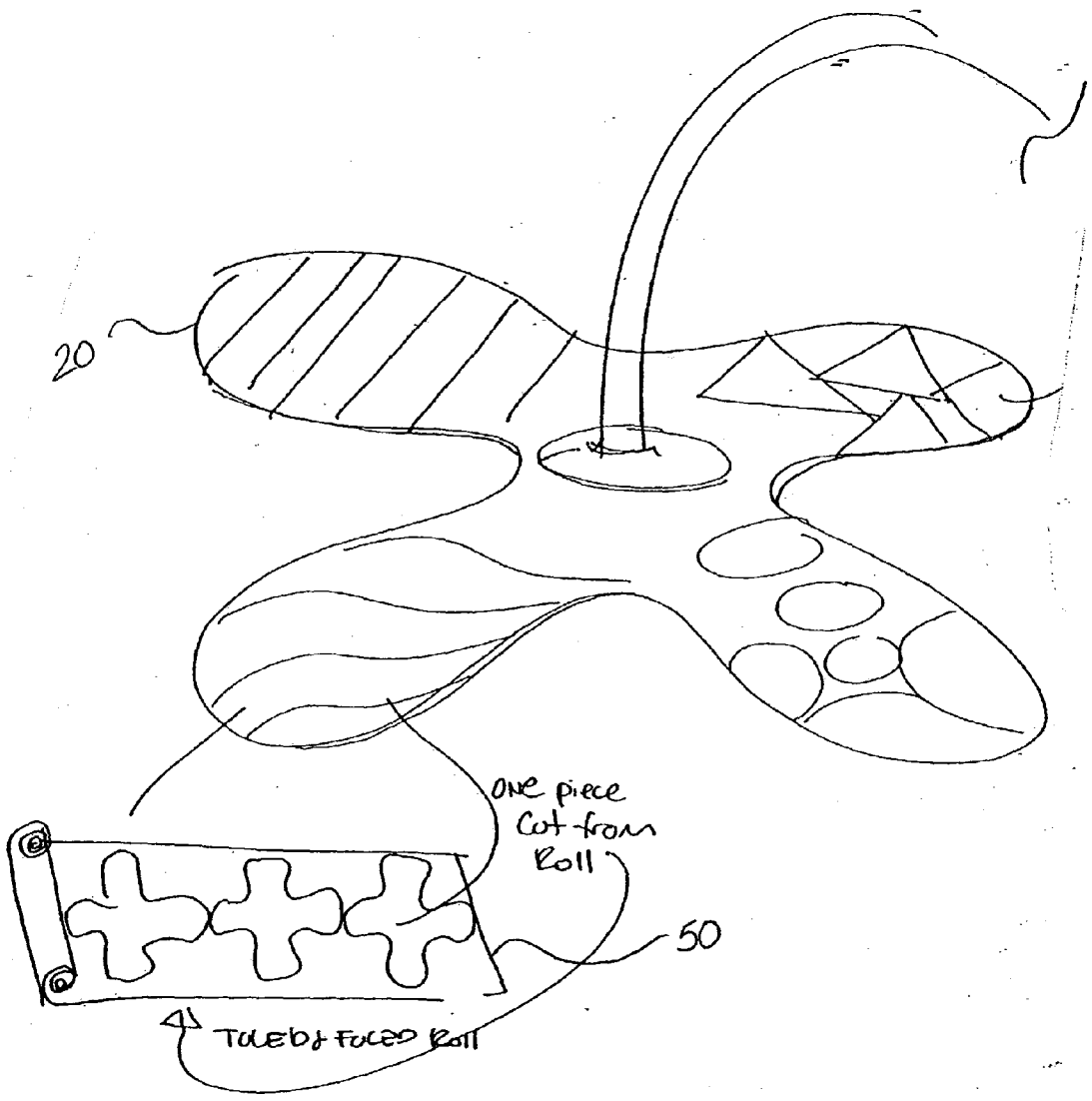


Fig. 9

HANGING MOBILE DEVICE WITH ELECTRONIC DISPLAY

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/356,843, filed Feb. 14, 2002, which is hereby incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to hanging mobile devices, and more specifically to hanging mobile devices having thin electronic displays.

BACKGROUND OF THE INVENTION

[0003] Conventional hanging mobile devices, such as baby mobiles or artistic mobiles have been used for many years for aesthetic and entertainment purposes. Baby mobiles, in particular, are typically formed of lightweight materials and hang above a baby's crib. Some such mobiles have moving parts and images designed to hold the attention of infants or young children.

[0004] Conventional mobiles are rather limited in that the images on the visible portions of the mobiles are fixed, or limited. Thus, they do not hold one's attention for prolonged periods of time, nor do they adjust for development of an infant. Furthermore, conventional mobiles have not enveloped the latest technology. For example, conventional mobiles have not utilized computers, wireless connection capabilities, sensors, cameras, audio output or thin electronic displays.

[0005] A mobile that does not have a fixed image, but rather is able to change images on its display must be of a material that is lightweight and flexible in the interest of a child's safety. Conventional displays would not likely work because they would be heavy and could injure a child upon falling. Traditional LCD panels, while capable of displaying a video display, would not be safe for use on a mobile because they are too heavy. A number of technologies maybe suitable for such displays, for example, flexible LCD panels, particularly flexible reflective LCD panels, thin film electroluminescent (TFEL) screens, or organic electroluminescent image display devices such as those described in U.S. Pat. No. 5,530,269, which is hereby incorporated by reference in its entirety, and in U.S. Pat. No. 5,276,380, which is hereby incorporated by reference in its entirety. Electronic displays utilizing OLED technology would also allow for micro-thin lightweight panels.

[0006] OLEDs consist of organic polymer and fluorescent dye layers less than 0.2 microns thick, sandwiched between two electrodes, the top one of which is transparent. When the polymer molecules are excited, flicker-free light is emitted. Each pixel is composed of three subpixels corresponding to red, green, and blue to form color images. OLED technology is described in detail in U.S. Pat. No. 5,482,896, which is hereby incorporated by reference in its entirety, and in U.S. Pat. No. 5,530,269 referred to above. U.S. Pat. No. 5,530, 269 and U.S. Pat. No. 5,276,380 also disclose a light emitting device comprising an organic light emitting diode array, but they do not disclose a hanging mobile device having an OLED display. Similarly, U.S. Pat. No. 5,641,611 discloses a method of fabricating OLED matrices but does not disclose a hanging mobile device having an OLED display.

[0007] Some conventional interactive toys are able to change displays, but such toys are not hanging mobile devices and are incapable of changing the image it displays independent of the user's input. For example, U.S. Pat. No. 5,603,658 issued to Cohen, discloses a computer play toy wherein the user provides an input signal on a keyboard. A computer processor in turn, responds to each signal by displaying on a display screen the next in a succession of a group of audiovisual sequences. The toy is limited to its pre-programmed visual sequences and is not capable of independently adjusting to the user. Similarly, U.S. Pat. No. 5,556,339 issued to Cohen discloses a computer toy for infants and children wherein the child sequentially creates a picture on a display screen by inputting a signal via a keyboard or other device. The computer processor responds to the input by assisting the child in sequentially developing a picture. The toy is also incapable of changing the image it displays independent of the user's input.

[0008] A mobile having a lightweight video display could have images change based on movement by a subject, such as a baby, independent of the user's input. This could significantly aid the development of an infant. Conventional mobiles do not attempt to aid with the development of an infant. Most newborns sleep 16-17 hours a day and are trying to deal with the amount of new stimulation around them. Yet still vision is fuzzy for the baby, and he only sees high-contrast shapes, light, and movement. At one to two months, the baby learns to focus both eyes and perfects object-tracing skills. Their first real smile appears along with a growing preference for complex designs such as checkerboards and spirals. Conventional mobiles cannot change their display images in response to a baby's development.

[0009] Furthermore, babies have difficulty distinguishing similar tones such as red and orange until about two months and continuing through four months when color becomes more clear. The baby is able to distinguish like shades, preferring bright primary colors and more detailed and complicated shapes. At four months, the baby begins to develop depth perceptions and better arm control, grabbing and reaching as depth perception develops. Between four and six months, he develops the ability to make some vocal sounds, such as 'ma-ma' or 'da-da.' Conventional mobiles or toys have not been able to adjust to the above developments in the mind of the infant.

[0010] Therefore, it would be advantageous to provide a hanging mobile device with a lightweight video display which would provide a greater range of display and interactive capabilities.

SUMMARY

[0011] In view of the deficiencies described above, it is an object of the present invention to provide a hanging mobile device having a lightweight electronic display which would provide a greater range of display and interactive capabilities.

[0012] It is a further object of the invention to provide a hanging mobile device having an electronic display capable of changing images and adjusting to the development of an infant.

[0013] In accordance with the above objectives, the present invention, in its broadest form, is a hanging mobile device having an electronic display. By "hanging mobile device" it is meant any device which is a mobile or a stationary hanging apparatus intended for use over or near the bed or crib of a child or baby. The electronic display is preferably a thin panel electronic display. In a preferred embodiment, the hanging mobile device is a mobile, but it is not necessary that the hanging mobile device move in response to an air current, as with a standard mobile.

[0014] In one aspect of the invention, one or more electronic panels are displayed on the mobile. The electronic panels are controlled by a computing device. The panels can selectively display still images, changing images, or video. The images can be programmed into the device or input into the device via input media.

[0015] In another aspect of the invention, the mobile includes a sensor which can detect noise, motion, or visual aspects of the environment. The mobile changes its display in response to the sensor input. Optionally, the mobile has an audio output in addition to the images or video display. In one embodiment of the invention, the mobile utilizes gesture recognition technology. In this manner, the electronic displays can be interactive, responding to various movements or noises made by the infant. The mobile is preferably programmable such that it can enhance development of an infant. Also, it can be customized to include selected images, photographs, audio feeds, etc.

[0016] In another aspect of the invention, the sensor, or another camera or sensing device, can serve as the input for a monitor, such as a baby monitor, and can transmit a signal to a receiving unit remote from the device. This would enable a parent, for example, to monitor an infant to see if the infant needs food, water, changing, or other medical care. In another embodiment of the invention, the invention could be used to monitor a patient in need of medical care.

[0017] Other features and advantages of the invention will be apparent from the following detailed description taken in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] **FIG. 1** is a perspective view of a preferred embodiment of the present invention showing an electronic display panel displaying an image.

[0019] **FIG. 2** is a perspective view of another preferred embodiment of the present invention showing an electronic display panel displaying an image.

[0020] **FIG. 3** is a perspective view of yet another preferred embodiment of the present invention showing an electronic display panel an image.

[0021] **FIG. 4** is a perspective view of yet another preferred embodiment of the present invention showing an electronic display panel an image.

[0022] **FIG. 5** is a perspective view of yet another preferred embodiment of the present invention showing an electronic display panel an image.

[0023] **FIG. 6** is a perspective view of a preferred embodiment of the present invention showing a baby interacting with the hanging mobile device.

[0024] **FIG. 7** is a perspective view of another preferred embodiment of the present invention showing a baby interacting with the hanging mobile device.

[0025] **FIG. 8** is a perspective view of an embodiment of the present invention showing different shapes of an electronic display panel.

[0026] **FIG. 9** is a perspective view of an embodiment of the present invention showing a video display panel formed from a sheet of thin electronic display material.

DETAILED DESCRIPTION

[0027] While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the broad aspect of the invention to the embodiments illustrated.

[0028] A hanging mobile device **10** having an electronic display panel **20** and a computing device for controlling at least one visual display displayed on an electronic display panel is disclosed. Optionally, the device **10** may have more than one display panel **20**. By "hanging mobile device"**10** it is meant any device which is a mobile or a stationary hanging apparatus intended for use over or near the bed or crib of a child or baby. The device **10** is preferably mounted above a baby's crib, although it could be mounted in any location where an infant may be situated for any significant period of time. The mounting may be a ceiling mount, a wall mount, a mounting on a portion of a crib, or a mounting on a stand which is disposed on the floor near a crib. The electronic display panel **20** of the device **10** is preferably a thin panel electronic display **30**, such as an OLED (Organic Light Emitting Display) display.

[0029] Organic LEDs consist of organic polymer and fluorescent dye layers less than 0.2 microns thick, sandwiched between two electrodes, the top one of which is transparent. When its polymer molecules are excited, flicker-free light is emitted. Each pixel is composed of three subpixels corresponding to red, green and blue to form color images. Currently, resolutions are better than 200-dpi and power consumption is lower than comparably sized LCDs. Its light weight and ability to rewrite images on itself make OLED a preferred choice for constructing the video display of this invention. OLED technology is described in detail in U.S. Pat. No. 5,482,896, which is hereby incorporated by reference in its entirety, and in U.S. Pat. No. 5,530,269 referred to above. The article entitled, "Semiconducting Polymers on Display," by Jennifer Ouellette in the American Institute of Physics magazine, The Industrial Physicist, June/July 2001 issue, hereby incorporated by reference in its entirety, also describes such technologies, including reference to the present invention derived from this inventor.

[0030] A number of other technologies that are lightweight and capable of displaying an image may also be suitable for such electronic displays, for example, flexible LCD panels, particularly flexible reflective LCD panels, thin film electroluminescent (TFEL) screens, organic electroluminescent image display devices such as those described in U.S. Pat. No. 5,530,269 which is hereby incorporated by reference in its entirety, and in U.S. Pat. No. 5,276,380 which is hereby incorporated by reference in its entirety.

[0031] In another embodiment, the device **10** has a sensor **30**, wherein the visual display responds to input of the sensor. For example, in one preferred embodiment, the device **10** comprises a sensor **30** for sensing sound, movement, gestures, or other visual aspects of the environment. The sensor **30** may cause the visual display to change images or sounds, such as changing to an off mode if the baby is sleeping. The sensor **30** communicates a signal to a computing device or to a remote receiver. The receiver has an audio or visual output. The sensor **30** optionally includes a microphone and the computing device optionally includes a recording device.

[0032] There is preferably a gesture recognition system wherein the visual display changes images in response to detected gestures. Gesture recognition technology can be utilized to sense and process various movements of an infant. Thus, the display/audio can be interactive and respond to an infant's movements or noises, or other aspects of the environment such as daylight, motion elsewhere in the room, time of day, etc. Recent developments in gesture recognition systems are based on computer vision principles. Images of the infant, for example, are taken by a charge coupled device (CCD), and computer vision algorithms are used to isolate and interpret the infant's movements in real time. The CCD has a camera which preferably extends down the center of the mobile to detect the infant's reactions. Any suitable sensor is contemplated, including but not limited to, CCD cameras and capacitance or proximity sensors which could be placed in a crib, for example.

[0033] The gesture recognition system optionally transmits a signal via a communication device upon detecting a predetermined occurrence. In this embodiment, the device **10** could be used to monitor the safety of the child. For example, the device could monitor if the baby is turning blue or choking and subsequently send a signal to a communication device to contact an ambulance, police, or a parent. Alternatively, the device **10** is capable of changing visual images based on the attentiveness or inattentiveness of an infant. For example, staring, smiling, and cooing activates image rollovers of more complex black and white images, thus maintaining the infant's interest. In yet another embodiment, the gesture recognition system **50** is adapted to detect a new gesture of an infant, and wherein the image is transmitted to an external computing device and stored.

[0034] In yet another embodiment, the gesture recognition system detects a developmental stage of a child and communicating with the electronic display panel to change images corresponding to the developmental stage of the child. The device **10** can be designed to keep pace with a developing infant, particularly during the critical periods of growth. The device preferably adapts as the child grows, using gesture/speech recognition input and visual/sound output. Thus, the device can be a great aid in the development of an infant. For example, though a baby's hearing is fully mature after the first month, sight development is gradual. Over the first 6-8 months, initial fuzzy vision will reach a clarity and depth perception of that of an adult. The device **10** can be configured to output many possible shapes, patterns, and images displayed at various stages of development, from black and white stills to full-motion color video in response to the infant's gestures. New shapes, colors and sounds influence gesture responses to determine whether a child's visual development is ready to proceed.

[0035] Optionally, the electronic display panel **20** of the device **10**, and preferably an OLED material, are in the shape of a rectangle or may be formed into the shape of an animal such as a butterfly or dog. Alternatively, the electronic display panels **20** may be formed into an irregular shape and formed of a single continuous panel **50**. The electronic display panels **20** are optionally bent out of plane into a desired shape.

[0036] In another embodiment, the device **10** has an audio output device. In yet another embodiment, the device **10** has a camera which preferably extends down the center of the mobile to take still photographs of an infant. The photographic data may then be displayed on the electronic display panel **20** or transmitted to a computing device. In yet another embodiment, the camera may be adapted to take a consecutive series of photographs of the baby or child. For example, the device **10** could take pictures of the baby at weekly intervals to record the growth of the baby over time. In yet another embodiment, the device **10** contains a system for displaying at least one picture taken by the camera. The camera is capable of transmitting an image to a computing device for storage. The camera is further capable of transmitting an image via a communication device, such as through the internet. For example, photos of a baby could be transmitted to a receiver via the internet such as to a digital picture frame which can be updated, or to an email address or website. Furthermore, video, audio, still images, or any combination thereof could be transmitted over the internet to receivers in any number of formats.

[0037] In yet another embodiment, the device **10** can display at least one image can be programmed into the device **10** or input into the device **10** via input media. A particular program may be selected by a parent or user, and customized images, video, or audio programs can be uploaded into the device. Data can be uploaded via any suitable media for inputting data, including by not limited to diskettes, CDs, DVD's, memory sticks, or any other suitable medium. Alternatively, photographs, images, video, or audio streams of people, such as an infant's parents or family members can be loaded into the device **10** for display. In another preferred embodiment, parents can select and download sound, images, and video to customize the mobile to their child's particular likes. In yet another embodiment, an audio stream may be programmed or input into the device **10**.

[0038] The mobile preferably includes the computing device within the same unit as the display panels **20**, however, the panels **20** may be coupled to a remote computing device, either combined with a mounting member, or elsewhere in the room, house, or even on a network or at a remote location. The connection can be wired or wireless. The wireless connection may be BLUE TOOTH technology, infrared, or any other suitable wireless connection.

[0039] In yet another embodiment, the device **10** is a chandelier. The device **10** may have lights included with the electronic display panels **20**. Alternatively, the electronic display panels **20** may be used as a light panel for a room.

[0040] The present invention further encompasses, within its scope, a method for providing a video display on a hanging mobile device as described above.

[0041] While the specific embodiments have been illustrated and described, numerous modifications come to mind

without significantly departing from the spirit of the invention, and the scope of protection is only limited by the scope of the accompanying claims.

What is claimed is:

1. A hanging mobile device comprising:

an electronic display panel, and

a computing device for controlling at least one visual display displayed on the electronic display panel.

2. The hanging mobile device according to claim 1, wherein said electronic display panel is a thin display panel.

3. The hanging mobile device according to claim 2, wherein the thin display panel is an organic light emitting diode display panel.

4. The hanging mobile device according to claim 2, further comprising a sensor, wherein the visual display responds to input of said sensor.

5. The hanging mobile device according to claim 4, further comprising a microphone in said sensor, and the device further comprising an audio recording device.

6. The hanging mobile device according to claim 4, wherein said sensor communicates a signal to an external processor.

7. The hanging mobile device according to claim 6, wherein the signal is communicated to a remote receiver, and wherein said receiver has an audio or visual output.

8. The hanging mobile device according to claim 2, wherein the device includes a gesture recognition system and wherein the visual changes images in response to detected gestures.

9. The hanging mobile device according to claim 8, wherein the gesture recognition system detects a developmental stage of a child and wherein the visual display changes images corresponding to the developmental stage.

10. The hanging mobile device according to claim 8, wherein the gesture recognition system transmits a signal via a communication device upon detecting a predetermined occurrence.

11. The hanging mobile device according to claim 6, wherein said gesture recognition system is adapted to detect a new gesture of an infant, a sensor takes a still or video image upon detecting the new gesture, and wherein the image is transmitted to an external computing device and stored.

12. The hanging mobile device according to claim 3, wherein said electronic display panel is in the shape of a rectangle.

13. The hanging mobile device according to claim 3, wherein said electronic display is in the shape of a butterfly.

14. The hanging mobile device according to claim 3, wherein said electronic display is cut into the shape of an animal.

15. The hanging mobile device according to claim 3, wherein said electronic display is an irregular shape formed of a single continuous panel.

16. The hanging mobile device according to claim 3, wherein said electronic display is bent out of plane into a desired shape.

17. The hanging mobile device according to claim 2, further comprising an audio output device.

18. The hanging mobile device according to claim 2, further comprising a camera for taking photographs.

19. The hanging mobile device according to claim 18, wherein said camera is adapted to take a consecutive series of photographs.

20. The hanging mobile device according to claim 18, wherein the device contains a system for displaying at least one picture taken by the camera on the display panel.

21. The hanging mobile device according to claim 18, wherein the camera transmits an image to a computing device for storage.

22. The hanging mobile device according to claim 18, wherein the camera transmits an image via a communication device.

23. The hanging mobile device according to claim 2, wherein at least one image can be programmed into the device or input into the device via input media.

24. The hanging mobile device according to claim 23, wherein an audio stream can be programmed into the device or input into the device.

25. The hanging mobile device according to claim 2, wherein said computing device and the video display communicate via a wireless connection.

26. The hanging mobile device according to claim 2, wherein said device is a chandelier.

27. A method of providing a visual display on a hanging mobile device comprising:

displaying an image on an electronic display panel, and

controlling at least one visual display displayed on the electronic display panel via a computing device.

28. The method according to claim 27, wherein the electronic display panel is a thin display panel.

29. The method according to claim 28, wherein the electronic display panel is an organic light emitting diode display panel.

30. The method according to claim 28, further comprising providing a sensor, wherein the visual display responds to input of said sensor.

31. The method according to claim 28, further comprising communicating a signal to an external processor via said sensor.

32. The method according to claim 31, further comprising providing said sensor with a microphone, and further comprising providing said device with an audio recording device.

33. The method according to claim 31, further comprising communicating said signal to a remote receiver.

34. The method according to claim 33, wherein said receiver comprises an audio or visual output.

35. The method according to claim 31, further comprising providing a gesture recognition system and changing the visual display in response to detected gestures.

36. The method according to claim 35, wherein the gesture recognition system detects a developmental stage of a child and wherein the visual display changes images corresponding to the developmental stage.

37. The method according to claim 35, wherein the gesture recognition system transmits a signal via a communication device upon detecting a predetermined occurrence.

38. The method according to claim 35, wherein said gesture recognition system is adapted to detect a new gesture of an infant, a sensor takes a still or video image upon detecting the new gesture, and wherein the image is transmitted to an external computing device and stored.

39. The method according to claim 29, further comprising forming the electronic display into the shape of an animal.

40. The method according to claim 29, further comprising forming said electronic display into an irregular shape from a single continuous panel.

41. The method according to claim 29, further comprising bending said electronic display out of plane into a desired shape.

42. The method according to claim 28, further comprising providing an audio output device on said device.

43. The method according to claim 28, further comprising providing a camera for taking photographs.

44. The method according to claim 43, wherein said camera is adapted to take a consecutive series of photographs.

45. The method according to claim 43, further comprising providing a system for displaying at least one picture taken by the camera.

46. The method according to claim 43, further comprising transmitting an image from the camera to a computing device for storage.

47. The method according to claim 43, wherein the camera transmits an image via a communication device.

48. The method according to claim 28, further comprising programming at least one image into the device or inputting at least one image into the device via input media.

49. The method according to claim 28, further comprising programming an audio stream into the device or inputting an audio stream into the device.

50. The hanging mobile device according to claim 28, wherein said computing device and the video display communicate via a wireless connection.

51. The hanging mobile device according to claim 28, wherein said device is a chandelier.

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