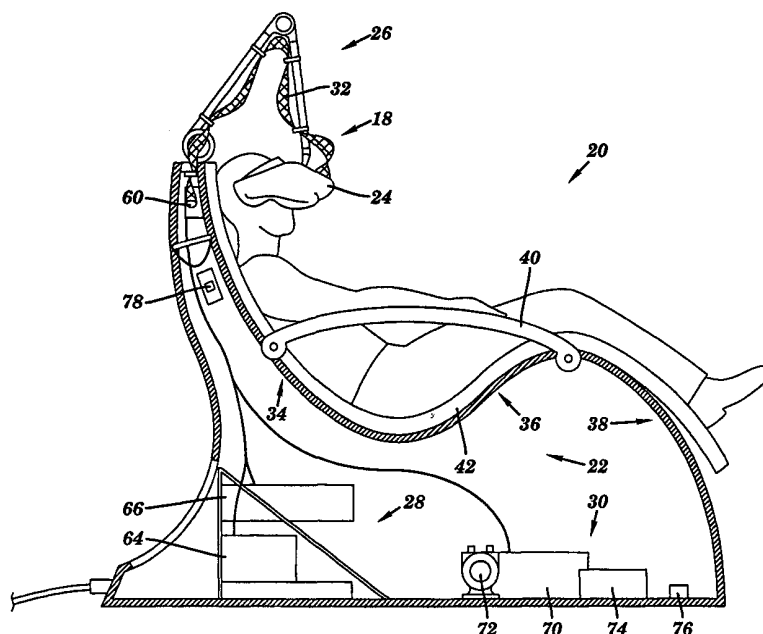




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(54) Title: VIRTUAL REALITY THERAPY SYSTEM AND METHOD OF USE



(57) Abstract

A virtual reality system which includes a stimuli system which delivers at least form of stimuli to an individual and a support structure connected to the stimuli system which positions the system adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli.

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VIRTUAL REALITY THERAPY SYSTEM AND METHOD OF USE

The present invention claims priority benefit of U.S. Provisional Patent Application Serial No. 60/130,152, filed April 20, 1999, which is hereby
5 incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a virtual reality system and to a
10 method of providing a virtual reality experience to an individual.

BACKGROUND OF THE INVENTION

The use of several techniques in the medical field to reduce or
15 eliminate emotional stresses caused by various treatments, such as chemotherapy, have been documented. One such technique involves the administration of drugs to physiologically ease a patient's pain or discomfort during medical treatments and healing.

Another technique involves the use of virtual reality systems,
20 which may calm, relax, and distract the patient. Virtual reality systems create a distraction intervention by immersing the user into a virtual reality experience which can mitigate the emotional stresses caused by medical treatments and can be used throughout the healing process.

Unfortunately, the virtual reality systems which presently exist are
25 not well developed for patient needs. In particular, such virtual reality systems typically are placed in contact with the user and are often supported by a part of the user's body, usually, the head of the user. For example, the virtual reality system of U.S. Patent No. 5,808,801 delivers visual and audio stimuli to the user through a headset that is strapped to or otherwise mounted on the head of the user.
30 The use of such virtual reality systems, which utilize contact and support with the user's body, interferes with and distracts from the experience which the virtual reality system is attempting to create. Thus, there is a need to provide virtual

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reality systems which better immerse the user in the experience being created by the system, in particular, for use in patient care.

5

SUMMARY OF THE INVENTION

The present invention relates to a virtual reality system which includes a stimuli system which delivers at least one form of stimuli to an individual and a support structure connected to the stimuli system which positions the system adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli delivered by the stimuli system.

The present invention also relates to a method of providing a virtual reality experience. This method involves positioning a stimuli system which delivers at least one form of stimuli to an individual adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli and delivering the at least one form of stimuli to the stimuli system.

The virtual reality system and method according to the present invention are capable of enhancing and better immersing the user, e.g., a patient, in the experience being created by the virtual reality system. The virtual reality system of the present invention is particularly well suited for use in patient therapy. In particular, with the use of the virtual reality system, the medical practitioner can, in addition to or in lieu of the use of drugs, place the patient in an environment radically different from that of a hospital, which can calm, relax, and distract the patient to emotionally ease the patient's pain or discomfort during medical treatments or healing processes. Further, the virtual reality system and method of the present invention are especially suited for use in therapeutic applications where the user is a patient with burns, sores, or other injuries which make contact with the user undesirable, for both patient comfort and hygiene reasons.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side elevation, partially in section view, of a virtual reality system in accordance with one embodiment of the present invention;

5 Figure 2 is a perspective view of the stimuli system and a portion of the support system of the virtual reality system of Figure 1;

Figure 3 is a side elevation, partially in section view, of the stimuli system of the virtual reality system of Figure 1; and

10 Figure 4 is a back view of the stimuli system of the virtual reality system of Figure 1.

DETAILED DESCRIPTION OF THE INVENTION

A virtual reality system 20 in accordance with one embodiment of the present invention is shown in FIGS. 1-4. The system 20 includes a stimuli system 18 which delivers at least one form of stimuli to an individual and a support structure or system 22 and 26 connected to the stimuli system which positions the system adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli delivered by the stimuli system. Advantages of the virtual reality system 20 of the present invention include better immersing the user in the experience being created by the virtual reality system, which may be particularly useful in patient therapy.

Referring to FIG. 1, the virtual reality system 20 includes a support system 22, such as a couch, although other support systems may be used. The support system 22 supports an individual's head, limbs, and trunk and maintains an individual's head in a comfortable, relaxed stationary, or substantially stationary position while the visual reality system is in use.

In this particular embodiment, the support system 22 supports the individual's body in a neutral position (a position developed by the National Aeronautics and Space Administration) to improve the individual's blood circulation and lower the individual's heart rate. The support system 22 in this particular embodiment includes a first section 34 for supporting the individual's

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head and trunk, a second section 36 for supporting the upper portions of the individual's legs or lower limbs, and a third section 38 for supporting the lower portions of the individual's legs or lower limbs, although the number and type of sections for the support system 22 can vary. The sections 34, 36, and 38 are

5 integrally formed together in this particular embodiment, although the support system 22 can have different numbers of sections which are joined together in other manners. In this particular embodiment, the first section 34 has an upper supporting surface for supporting an individual's trunk which is inclined at a lesser included angle to the horizontal of about 30° to about 40°, typically, about

10 35°, and for supporting an individual's head which is inclined at a lesser included angle to the horizontal of about 60° to about 70°, typically, about 65°.

Additionally, in this particular embodiment, the second section 36 has an upper supporting surface for supporting upper portions of the individual's lower limbs (an individual's upper legs) which is inclined at a lesser included angle to the

15 horizontal of about 30° to about 40°, typically, about 35°. Further, in this particular embodiment, the third section 38 has an upper supporting surface for supporting lower portions of the individual's lower limbs (an individual's lower legs) which is inclined at a lesser included angle to the horizontal of about 25° to about 35°, typically, about 30°. Although one support system 22 is shown, other

20 variations of the support system 22 can be used, such as a bed or chair.

In this particular embodiment, padded arm rests 40 support the upper limbs of the individual. At least one of the arm rests 40 may be pivotally mounted to the support system 22 at one end and can be swung or pivoted up out of the way to permit a user to get on or off the support system 22. Although one

25 type of padded arm rests 40 is shown, other variations of the padded arm rests 40 can be used.

An optional foam layer 42 covers the upper support surfaces of the support system 22. In this particular embodiment, the foam layer 42 is a moldable foam that deforms or yields under the individual's weight and body heat to

30 precisely contour itself to the contours of the individual's body in contact with the foam layer 42, i.e. the back of the individual's head, trunk, and lower limbs, and to support the individual in a manner that feels safe, secure, comfortable, and

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relaxing. The foam also is an open celled foam which is self-ventilating to keep the user cool, comfortable and perspiration free over a wide range of ambient room temperatures, although other types of foam may be used. An example of the foam material for the foam layer 42 is a foam sold under the trademark

- 5 "TEMPUR-PEDIC" by Tempur-Pedic Inc. Other variations of the foam layer 42 include alternative cushioning devices, such as conventional pillows, standard foam, and rubber.

- The use of such a foam layer 42 with the support system 22, which supports the individual in a neutral position, eliminates or greatly reduces pressure
- 10 points which would be a distraction to the individual and lets the individual experience soft and yielding yet firm support that is comfortable and relaxing. This type of support facilitates the immersion of the individual in the virtual reality experience being created by the virtual reality system 20 by reducing external distractions and giving the individual a sense of well being and security.
- 15 This type of support is especially useful when using the virtual reality system 20 in therapy with patients who have conditions which require soft, yielding, yet firm support such as, but not limited to, burn patients or other patients with sores, injuries, or other sensitive skin conditions.

- Referring to FIGS. 1-4, the virtual reality system 20 of the present
- 20 invention includes a stimuli system 18. In this particular embodiment, the stimuli system 18 includes a visual display system 48, an olfactory delivery system 50, an audio delivery system 52, a video source 64, an audio source 66, and a fragrance dispenser 30. Further, in this particular embodiment, the visual display system 48 includes a conventional, commercially available, full color, liquid crystal display
- 25 (LCD) screen such as, but not limited to, a 320 X 240 ppi screen which displays an image equivalent to an 80 inch screen 5 feet from the viewer. An example of such a visual display is a visual display sold by Virtual Research Systems Inc. of Santa Clara, California under the trademark "I-GLASSES!". Other suitable visual displays include VR6 by Virtual Research Systems, Inc. (Santa Clara, CA) and
- 30 Sony Glasstron. Visual stimuli (images) are delivered to the visual display system 48 through a delivery cable and tubing housing 32 for housing the cable(s) and tubing that deliver visual, audio, and olfactory stimuli from visual and audio 28, and olfactory 30 sources. Suitable video sources 64 include a commercially

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available laser disk player, such as, but not limited to, a CD CDV LD player sold by Pioneer Electronic Corporation of Japan under the designation "CLD-V2800". Other variations may include video cassette players (e.g., Sony High 8mm (EVC200), super VHS players, and Beta players) and digital video devices. In the particular embodiment shown, the video source 64 is housed within the support system 22. Since the components, connections, and operation of video display systems 48 are well known to those of ordinary skill in the art, they are not discussed in detail here.

The olfactory delivery system 50 is typically a multi-chambered tube 68 which can independently deliver a plurality of different scents or fragrances from a conventional, commercially available, fragrance dispenser 30, such as but not limited to a seven-chamber delivery tube which can deliver seven different scents. In this particular embodiment, the fragrance dispenser 30 is housed within the support system 22 and includes a scent manifold 70, a compressor 72, a circuit board 74 which electronically connects the fragrance dispenser 30 to the video source 64 and the audio source 66, and a power source 76 which also supplies power to the video source 64 and the audio source 66. An example of a fragrance dispenser which can be used in the virtual reality system of the present invention is a fragrance dispenser marketed by Fragrance Technologies Incorporated and disclosed in U.S. Patent No. 5,610,674, which is hereby incorporated by reference. Since the components, connections, and operation of olfactory delivery systems 50 are well known to those of ordinary skill in the art, they are not discussed in detail here.

In this particular embodiment, the audio delivery system 52 is conventional, commercially available stereophonic earphones such as the stereophonic earphones sold by Sennhieser (Old Lyme, CT). Audio stimuli (sounds) are delivered to the audio delivery system 52 through the delivery cable and tubing housing 32 by an electrical cable from a conventional, commercially available audio source 66, such as but not limited to a compact disk player, such as a double compact disk CD player sold by Numark Industries of Providence, Rhode Island under the designation "CD7030 - DOUBLE CD PLAYER". Other variations of the audio source may include conventional cassette tape players and digital audio sources (e.g., MP3 and digital .wav files). In the particular

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embodiment shown, the audio source 66 is housed within the support system 22. Since the components, connections, and operation of audio delivery systems 52 are well known to those of ordinary skill in the art, they are not discussed in detail here.

5 Referring to FIGS. 1-4, the stimuli system 18 also includes a headset 24, which transmits at least one of visual, olfactory, and audio stimuli. In this particular embodiment, the visual, olfactory, and audio headset 24 has a generally C-shaped horizontal transverse cross section with a front midsection 44 which is placed before the individual's face and two lateral sections 46 which
10 extend back from each side of the front midsection 44 along each side of an individual's head to an individual's ears. The front midsection contains the visual display system 48 and the olfactory (scent) delivery system 50 and the two lateral sections 46 contain the audio delivery system 52, e.g., at least one earphone, typically, two earphones. In one embodiment, the headset 24 is sized so that the
15 audio delivery system 52 does not contact the individual's ears and is located opposite the individual's ears when the front midsection 44, with the visual display system 48 and the olfactory delivery system 50, is properly positioned in front of but not in contact with the individual's face. In other words, when the headset 24 of the present invention, in one particular embodiment, is centered
20 relative to the individual's face (the front of the individual's head) and properly spaced from the individual's face, with the visual display system properly aligned with the individual's eyes and the olfactory delivery system adjacent the individual's nostrils, the inner surfaces of the two lateral extensions do not contact the sides of the individual's head including the individual's ears.

25 The minimum clearance between the individual's face or head and the inner surface of the front midsection 44 of the headset 24 (see A in FIG. 3) can be a little as about 0.25 inches. While the individual's head is normally stationary, this permits slight movements of the individual's head without contacting the headset 24 with his/her face. The maximum clearance between the
30 individual's face or head and the inner surface of the headset 24 is about 2 inches. Greater clearances between the individual's face and the inner surface of the headset 24 could begin to cause a distraction by permitting too much light to enter the space between the individual's eyes and the visual display system 48. If

desired, the stimuli system 18 can be provided with upper and lower flaps or blinds 80 which extend around at least a portion of the perimeter of the stimuli system 18 to shade or block out external light. In one particular embodiment, the upper and lower flaps 80 are soft and flexible and made from a material such as, but not limited to, a soft, flexible closed cell foam so that, if the upper and/or lower flaps do contact the individual's face, the flaps will easily yield and bend rather than press hard against the individual's face. As shown in FIG. 3, the stimuli system 18 may extend in height from the upper portion of the individual's forehead to below the individual's nose to enclose the individual's eyes and nose within the stimuli system 18.

The minimum clearance between the sides of the individual's head including the ears and the inner surfaces of the lateral section 46 of the headset 24 (see B in FIG. 4) can be a little as about 0.25 inches. While the individual's head is normally stationary, this minimum clearance permits slight movements of the individual's head without contacting the headset 24 with his/her ears. The maximum clearance between the individual's ears and the inner surfaces of the headset 24 is about 2 inches. Greater clearances between the individual's ears and the inner surfaces of the headset 24 could begin to cause a distraction by permitting too much external sound to enter the individual's ears.

The head sizes of individuals using the virtual reality system 20 of the present invention will vary in size. However, the above range of clearances between an individual's head and the stimuli system 18, permits the use of a stimuli system 18 of a particular size with individual's having various head sizes. It is contemplated that one or more stimuli systems of smaller dimensions could be used for children while one or more stimuli systems of larger dimensions could be used for adults. Alternatively, the lateral sections 46 can be joined to the front midsection 44 by conventional connections which permit the spacing between the inner surfaces of the lateral sections 46 to be expanded or reduced from a selected spacing to adjust the internal width of the headset 24 to accommodate heads of different sizes and the lateral sections 46 can be adjustable in length to best position the earphones relative to the ears and accommodate heads of different sizes.

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In another embodiment, at least one of a visual display system 48, an olfactory delivery system 50, and an audio delivery system 52, as described herein, could be provided as independent elements of the stimuli system 18.

As shown in FIGS. 1-3, the particular embodiment of the virtual reality system 20 of the present invention includes, as part of the support structure, a stimuli system support 26. As schematically shown in FIG. 2, the stimuli system support 26 permits the stimuli system 18 to be supported and moved or positioned independent of an individual along a vertical axis and two horizontal axes which are all oriented at right angles with respect to each other. With the stimuli system support 26, which is not mounted on or otherwise supported by the individual's head, the stimuli system 18 can be moved vertically upward and downward, laterally from side to side, and toward or away from an individual's head to properly and precisely locate the stimuli system at a selected location relative to an individual. In the embodiment of the invention shown, the stimuli system support 26 includes at least one moveable arm. In this particular embodiment, the stimuli system support has two arms 54 and 56 (each about 15 1/2 to 16 inches long in this particular example) which are pivotally joined to each other at one end by an elbow hinge joint 58. The first arm 54 is mounted on or secured to the support system 22 by a ball joint 60 that permits the arm 54 to be rotated 360° about a vertical axis and to be pivoted about horizontal axes through about 230°. The stimuli system 18 is mounted on or secured to the end of the second arm 56 by a ball joint 62 which permits the stimuli system 18 to be rotated 360° about a vertical axis and to be pivoted about horizontal axes through about 200°. The ease with which the joint components move with respect to each other or the force required to pivot the arms 54 and 56 about the joints 58 and 60 and the stimuli system about the joint 62 can be adjusted so that, when the stimuli system 18 is properly located relative to the individual and released, the stimuli system 18 will remain in place and not move until the location of the stimuli system is readjusted. The stimuli system support 26 permits the individual to properly locate and maintain the stimuli system 18 at a selected location relative to an individual so that the stimuli system 18 is not in contact with an individual but positioned with the visual display system 48 before and adjacent an

individual's eyes, the olfactory delivery system 50 adjacent an individual's nostrils, and the earphones 52 adjacent an individual's ears while the virtual reality system 20 is in use. As used herein, stimuli receptors include the eyes, nostrils, and ears. However, stimuli receptors may also include the mouth and
5 skin.

With the virtual reality system 20, at least one of visual, olfactory, and audio stimuli (images, scents or fragrances, and sounds) are delivered by a conventional control unit to the visual display system 48, the olfactory delivery system 50, and the audio delivery system 52 from the visual, olfactory, and audio
10 sources 28 and 30 to create a desired experience for a user. In one embodiment, at least two of visual, olfactory, and audio stimuli are delivered to the visual display system 48, the olfactory delivery system 50, and the audio delivery system 52. In yet another embodiment, where at least two of visual, olfactory, and audio stimuli are delivered, they are delivered synchronously.

15 In the particular embodiment of the present invention shown, the virtual reality system 20 includes a user control device (e.g., remote control unit) 78. In this particular embodiment, the user control devices allows the individual using the virtual reality system 20 to control the delivery of the visual, olfactory, and/or audio stimuli to the stimuli device 24.

20 As discussed above, the virtual reality system 20 of the present invention can be used both for therapeutic and other applications. The use of the virtual reality system 20 will now be discussed in detail. In use, with the stimuli system 18 positioned out of the way, one of the arms 40 is raised and the individual, e.g., patient, assumes a comfortable position on the support system 22.
25 When the individual is positioned on the support system, the individual's body heat and weight cause the foam layer 42 to yield and conform to the contours of the individual's body (conform to the back of the individual's head, trunk, and lower limbs) to give the individual soft, yielding, non-distracting, yet firm support. The arm 40 is then lowered and the individual is given a remote control
30 78 (shown detachably mounted on the side of the support system) to control the operation of the virtual reality system 20. The stimuli system 18 is then positioned relative to the patient's head in a desired position, e.g., out of contact

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with the patient's head so that contact of the stimuli system 18 with the patient will not be a distraction, and left in that position.

With the virtual reality system 20 turned on, the patient can control the system with the remote control 78 which typically has by way of example
5 only: a start/stop button to begin or stop the synchronized delivery of stimuli (images, scents or fragrances, and/or sounds) from the visual 64, olfactory 30, and audio 66 sources to the visual display system 48, the olfactory delivery system 50, and the audio delivery system 52 to create the desired experience for the patient; a
10 pause button to temporarily pause the entire system; a scent on and scent off button to turn the supply of fragrances on or off; and volume buttons to increase or decrease the volume of the audio delivery system.

When using the virtual reality system 20 for therapeutic purposes, the experience created by the system is designed to relax and calm the patient. This use of virtual reality helps the patient through difficult phases of various
15 medical treatments by enabling the patient to transport himself or herself to a different state of consciousness, which has been shown to assist in the healing process. To calm and relax the patient, images, sounds, and scents are created and combined to create a soothing dream-like experience. In this particular
20 embodiment, the imagery is created in a 3D stereoscopic format which, through depth perception, increases or enhances the quality of the patient's immersion in the experience. The imagery may be computer graphical and video imagery that is crafted for the specific purpose of relaxing the viewer. When in a calm dream-like state, the human mind communicates in a less literal, more symbolic manner, therefore the visual symbols of peace, life, transformation, and rebirth may be
25 chosen to calm the mind and relax the body of the patient. The sound supplied to the audio delivery device may be calming and soothing musical scores and accompanying sound effects which with the images will further calm and relax the patient. When aromatherapy, through the use of aromas or scents developed to trigger pleasant and calming emotions and matched to the images on the display
30 screen and the sound effects delivered through the audio delivery system, is combined with the visual and audio effects of the system, the overall relaxing and calming atmosphere created further enables the patient to transport himself or

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herself to a different state of consciousness which will assist in the patient's healing process.

Although the invention has been described in detail for the purpose of illustration, it is understood that such detail is solely for that purpose, and
5 variations can be made therein by those skilled in the art without departing from the spirit and scope of the invention which is defined by the following claims.

WHAT IS CLAIMED:

1. A virtual reality system comprising:
a stimuli system which delivers at least one form of stimuli to an
5 individual, and
a support structure connected to the stimuli system which positions
the system adjacent to but spaced from a stimuli receptor of the individual
corresponding to the form of the stimuli delivered by the stimuli system.
- 10 2. The virtual reality system according to claim 1 wherein the
stimuli system comprises a headset.
3. The virtual reality system according to claim 1 wherein the
stimuli system comprises at least one of a visual display system, an olfactory
15 delivery system, and an audio delivery system.
4. The virtual reality system according to claim 3 wherein the
stimuli system comprises at least two of a visual display system, an olfactory
delivery system, and an audio delivery system.
- 20 5. The virtual reality system according to claim 4 wherein the
at least two of a visual display system, an olfactory delivery system, and an audio
delivery system are adjustably attached to each other.
- 25 6. The virtual reality system according to claim 1 wherein the
stimuli system further comprises blinds extending around at least a portion of the
perimeter of the stimuli system.
7. The virtual reality system according to claim 1 wherein the
30 at least one form of stimuli from the stimuli system is visual stimuli, audio stimuli,
or olfactory stimuli.

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8. The virtual reality system according to claim 1 wherein the at least one form of stimuli from the stimuli system is at least two forms for stimuli.

5 9. The virtual reality system according to claim 8 wherein the at least two forms of stimuli are delivered synchronously.

10 10. The virtual reality system according to claim 1 wherein the stimuli system is positioned at from about 0.25 inches to about 2 inches from the individual.

11. The virtual reality system according to claim 1 wherein the support structure comprises at least one moveable arm.

15 12. The virtual reality system according to claim 11 wherein the support structure comprises two moveable arms pivotally joined to each other at one end.

20 13. The virtual reality system according to claim 1 wherein the support structure further comprises a seating device to support the individual's body.

25 14. The virtual reality system according to claim 13 wherein the seating device supports the individual's body in a neutral position.

15. The virtual reality system according to claim 13 wherein the seating device further comprises a foam layer adjacent to and in contact with at least a portion of the individual's body.

30 16. The virtual reality system according to claim 15 wherein the foam layer comprises a moldable foam layer.

17. The virtual reality system according to claim 16 wherein the moldable foam layer comprises an open-celled foam.

18. The virtual reality system according to claim 1 further comprising a user control device, wherein the user control device controls the delivery of the at least one form of stimuli to the stimuli device.

19. The virtual reality system according to claim 1 wherein the stimuli system further comprises at least one source for at least one form of stimuli.

20. A method of providing a virtual reality experience comprising:
positioning a stimuli system which delivers at least one form of stimuli to an individual adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli and delivering the at least one form of stimuli to the stimuli system.

21. The method according to claim 20 wherein the stimuli system comprises a headset.

22. The method according to claim 20 wherein the stimuli system comprises at least one of a visual display system, an olfactory delivery system, and an audio delivery system.

23. The method according to claim 22 wherein the stimuli system comprises at least two of a visual display system, an olfactory delivery system, and an audio delivery system.

24. The method according to claim 23 wherein the at least two of a visual display system, an olfactory delivery system, and an audio delivery system are adjustably attached to each other.

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25. The method according to claim 20 wherein the stimuli system further comprises blinds extending around at least a portion of the perimeter of the stimuli system.

5 26. The method according to claim 20 wherein the at least one form of stimuli is selected from the group consisting of visual stimuli, audio stimuli, and olfactory stimuli.

10 27. The method according to claim 20 wherein the at least one form of stimuli is at least two forms for stimuli.

28. The method according to claim 27 further comprising delivering the at least two forms of stimuli synchronously.

15 29. The method according to claim 20 wherein the individual is a patient being treated for a medical condition.

20 30. The method according to claim 20 wherein said positioning comprises positioning the stimuli system at from about 0.25 inches to about 2 inches from the individual.

25 31. The method according to claim 20 wherein said positioning comprises attaching a support structure to the stimuli system which positions the stimuli system adjacent to but spaced from a stimuli receptor of the individual corresponding to the form of the stimuli.

32. The method according to claim 31 wherein the support structure comprises at least one moveable arm.

30 33. The method according to claim 32 wherein the support structure comprises two moveable arms pivotally joined to each other at one end.

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34. The method according to claim 31 wherein the support structure further comprises a seating device to support the individual's body.

5 35. The method according to claim 34 wherein the seating device supports the individual's body in a neutral position.

36. The method according to claim 34 wherein the seating device further comprises a foam layer adjacent to and in contact with at least a portion of the individual's body.

10

37. The method according to claim 36 wherein the foam layer comprises a moldable foam layer.

15 38. The method according to claim 37 wherein the moldable foam layer comprises an open-celled foam.

39. The method according to claim 20 further comprising providing a user control device, wherein the user control device controls the delivery of the at least one form of stimuli to the stimuli device.

20

40. The method according to claim 20 further comprising providing at least one source for at least one form of stimuli.

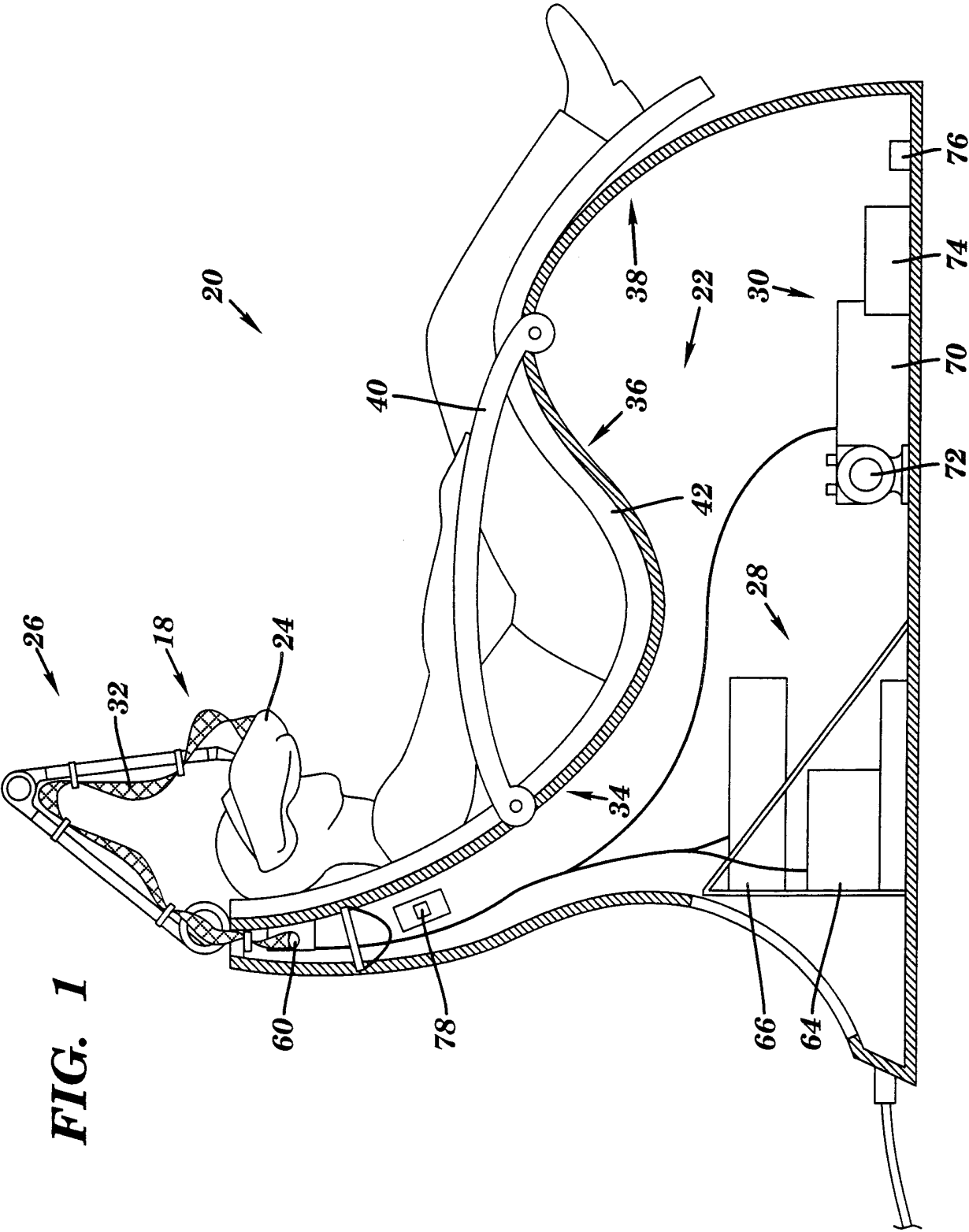


FIG. 1

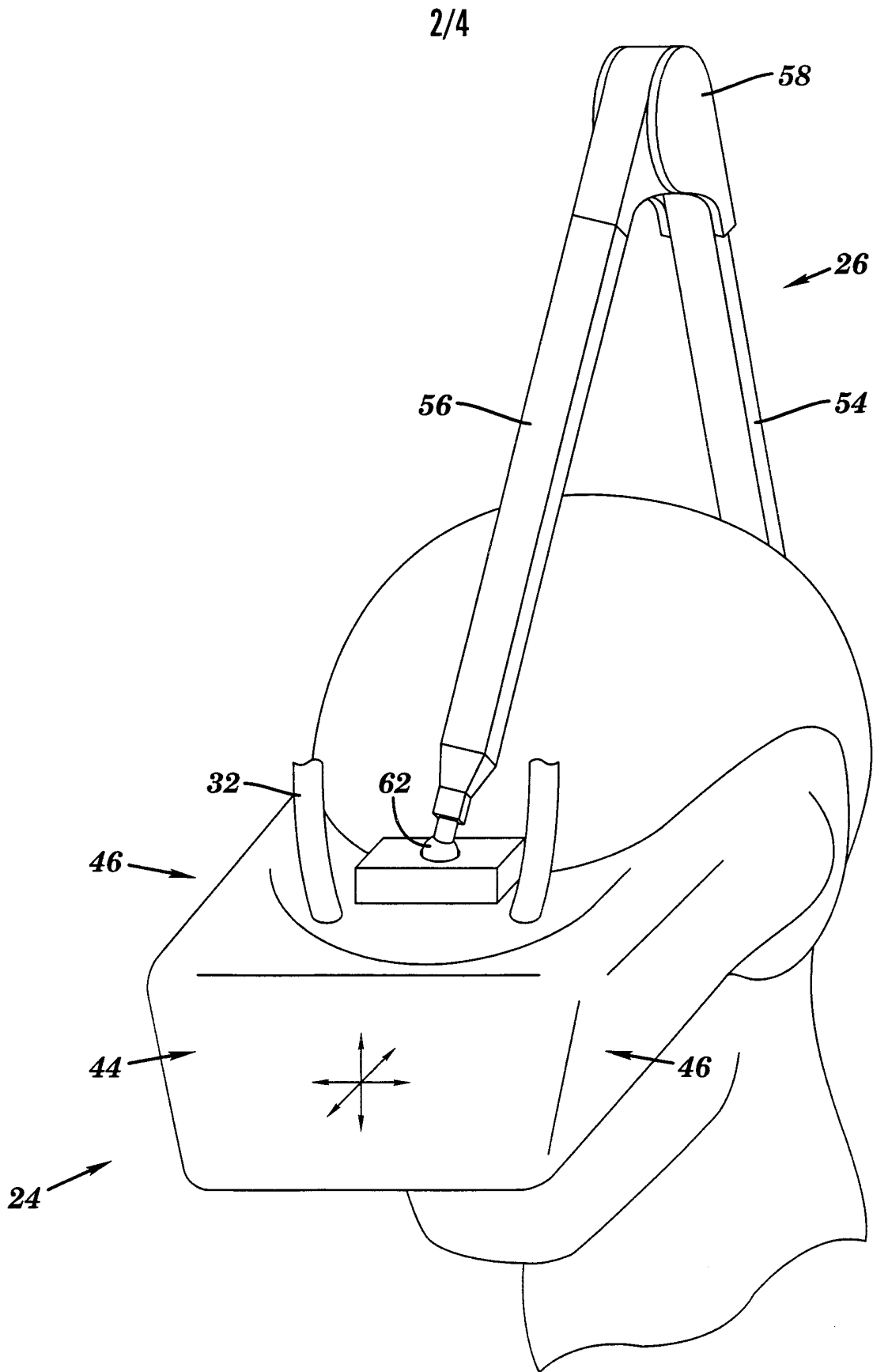
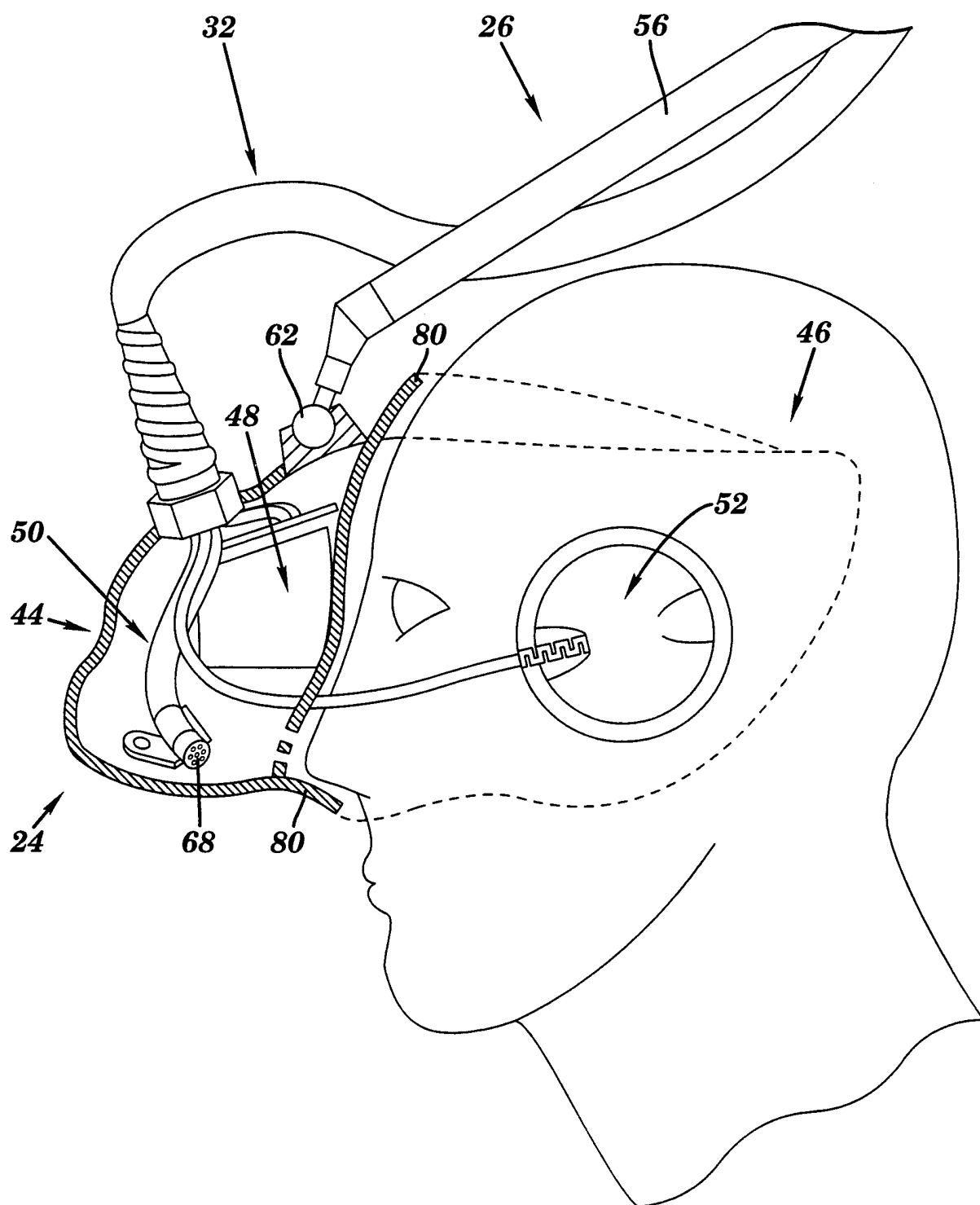


FIG. 2
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**FIG. 3**

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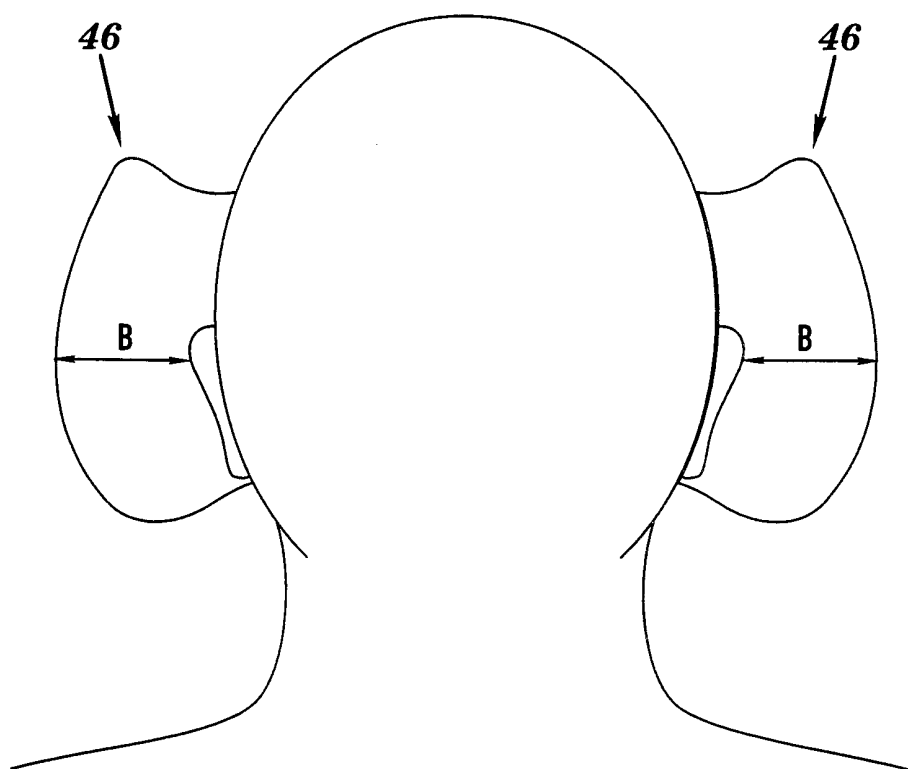


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/10620

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61M 21/00

US CL : 600/27

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 600/26-28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,902,274 A (GLEESON, III) 20 February 1990, see abstract and claims 1 and k4.	1-11, 18-32, 39, 40
X	US 5,318,503 A (LORD) 07 June 1994, see abstract and claim 1.	1-5, 7-11, 18-32, 39, 40
X	US 4,640,266 A (LEVY) 03 February 1987, see abstract and claim 1.	1-5, 7-10, 13, 18-24, 26-31, 34, 39, 40
X	US 5,266,070 A (HAGIWARA et al.) 30 November 1993, see abstract, figures 1-4 and claims 1, 3, 5-8 and 12.	1, 3-5, 7-9, 13, 14, 18-20, 22-24, 26-29, 31, 34, 35, 39, 40



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*G* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

22 AUGUST 2000

Date of mailing of the international search report

05 SEP 2000

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/10620

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,387,178 A (MOSES) 07 February 1995, see abstract and claims 1-9.	1, 3-5, 7-9, 13, 14-20, 22-24, 26- 31, 34-40
A, P	US 6,012,926 A (HODGES et al.) 11 January 2000, see entire document.	