THREE DIMENSIONAL MONITOR AND TACTILE SCANNER

This application is a continuation-in-part of application Ser. No. 09/312,901, filed May 17, 1999, entitled Three Dimensional Input-Output System, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is to a three-dimensional monitor and tactile scanner for transmitting, storing, and displaying three dimensional models.

2. Description of the Prior Art

As computers play an increasingly important role in our lives, unlimited numbers of two dimensional displays are presented to us in many diverse forms such as computer monitors, television screens, calculators, and digital watch faces. As computers continue to be integrated into the entertainment industry, many of these displays are built to provide a three dimensional effect by overlapping displays of blue, green and red slightly offset from each other to give a feeling of "depth" to the display. Some devices such as the "Three-D glasses" have been used to project a sense of depth to the screen in a similar manner.

However, there are no commercially viable true three-dimensional displays that can display both the image and contour of an object in real time. The present invention provides a method and apparatus for displaying a three dimensional object, as well as providing a three dimensional display that can be used as a tactile scanner to scan a three dimensional object for display by the same or a remotely connected display. In this way a sense of touch can be transmitted thousands of miles in real time as well as providing interactive modeling over the internet or other networks. Additionally, images stored or created in a computer can come to life in a repeatable and changeable three dimensional presentation.

Attempts have been made in the past to create a three dimensional "picture" by depositing material in successive layers to duplicate the original object, or one created entirely in a computer model. Numerous innovations for three dimensional devices have been provided in the prior art that are described as follows. Even though these innovations may be suitable for the specific individual purposes to which they address, they differ from the present invention as hereinafter contrasted. The following is a summary of those prior art patents most relevant to the invention at hand, as well a description outlining the differences between the present invention and the prior art.

1. U.S. Pat. No. 5,121,329—"Apparatus And Method For Creating Three Dimensional Objects", by Cramp

Described in the patent to Cramp is an apparatus incorporating a movable dispensing head provided with a supply of material which solidifies at a predetermined temperature, and a base member, which are moved relative to each other along "X," "Y," and "Z," axes in a predetermined pattern to create three-dimensional objects by building up material discharged from the dispensing head onto the base member at a controlled rate. The apparatus is preferably computer driven in a process utilizing computer aided design (CAD) and computer-aided (CAM) software to generate drive signals for controlled movement of the dispensing head and base member as material is being dispensed. Three-dimensional objects may be produced by depositing

repeated layers of solidifying material until the shape is formed. Any material, such as self-hardening waxes, thermoplastic resins, molten metals, two-part epoxies, foaming plastics, and glass, which adheres to the previous layer with an adequate bond upon solidification, may be utilized. Each layer base is defined by the previous layer, and each layer thickness is defined and closely controlled by the height at which the tip of the dispensing head is positioned above the preceding layer.

2. U.S. Pat. No. 5,059,266—"Apparatus And Method For Forming Three Dimensional Article", by Yamane

In the patent to Yamane, described is an apparatus and a method for forming a three-dimensional article with photosetting or thermosetting material on the basis of a three-dimensional information on the article by means of an ink jet method. The material is jetted from at least one ink jet head to a stage and laminated thereon. The laminated material is exposed to light by a light source to be cured. In this process, a jetting direction of the material from the ink jet head to the stage and/or a jetting amount of the material jetted from the ink jet head is changed in accordance with the information by a control unit, thereby forming a solid article having a desired three-dimensional shape.

3. U.S. Pat. No. 5,807,437—"Three Dimensional Printing System", by Sachs

Described in the patent to Sachs is a system for producing three dimensional components by bonding together successive layers of a porous material with droplets of a binder material. A binder printhead has an array of nozzles which controllably supply jets of binder material droplets to the layers of porous material. The printhead is scanned in a raster scan fashion over each layer of porous material along a first scan axis in one direction to provide first fast scanning paths of droplets. The printhead is then moved laterally of such one direction and is then moved along the fast-scan axis in the opposite direction to provide second fast scanning paths of droplets which are interlaced with the first scanning paths. The supply of the droplets to the porous material can be controlled so as to control the overlapping thereof to produce various desired surface and interior characteristics of the components.

4. U.S. Pat. No. 4,814,826—"Printer For Three Dimensional Lenticular Print Material", by Fritsch

In the patent to Fritsch, a method of effecting a three-dimensional print by a non-scanned exposure of three-dimensional lenticular print material is provided wherein a lenticular print material and a film having a plurality of exposed frames thereon are placed in opposing imaging planes and a lens and a periscope are positioned between the film and the print material; the periscope including first and second parallel mirrors positioned so as to reflect light along an optical path from the film through the lens to the print material, each of the parallel mirrors rotatable about a first axis normal to the lens optical axis and a second axis intersecting the first axis. Each of the frames is placed a predetermined linear distance from an optical axis of the lens to create a plurality of angular exposure zones corresponding respectively to the plurality of the frames and, for each of the plurality of angular exposure zones; the lens is placed in the center of the angular exposure zone; and the frame corresponding to the angular exposure zone is illuminated for delivering an image exposure of the frame to the periscope along the center of the angular exposure zone; thereby removing the translation (offset of) the image exposure delivered to the periscope from the lens along the center of the angular exposure zone from the periscope to the print