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Marshall Space Flight Center



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Optimal Read/Write Memory System Components

Two holographic data storage and display systems, a voltage gradient ionization system, and a linear strain manipulation system may result, through further development, in the creation of fast, high bit density, storage devices. In recording an array of images or holograms on photoplastic material, a uniform charging of the material surface and a uniform heating of the separate resistive pads (see Figure 1) under each hologram is required. A novel mounting fixture for photoplastic arrays permits a uniform charging field to be obtained across the array area without obstructing the laser illumination paths. The major parts of the fixture were machined from polycarbonate, a translucent di-

electric material. The holographic recording plate, inserted into the rear of the fixture, is accurately positioned by three registration pins and is secured to the fixture body with two large clamps. The clamps also apply pressure on the recording plate for contact with the beryllium-copper springs which are used to connect the heating voltages to the hologram array electrodes.

The corona discharge device, consisting of a single loop of 4-mil (0.102 mm) wire and an electrically grounded shield, is mounted in the front part of the fixture. It is secured in place with a front plate and 6 screws. The wires along the top and bottom of the fixture are used to connect the holograph array to an

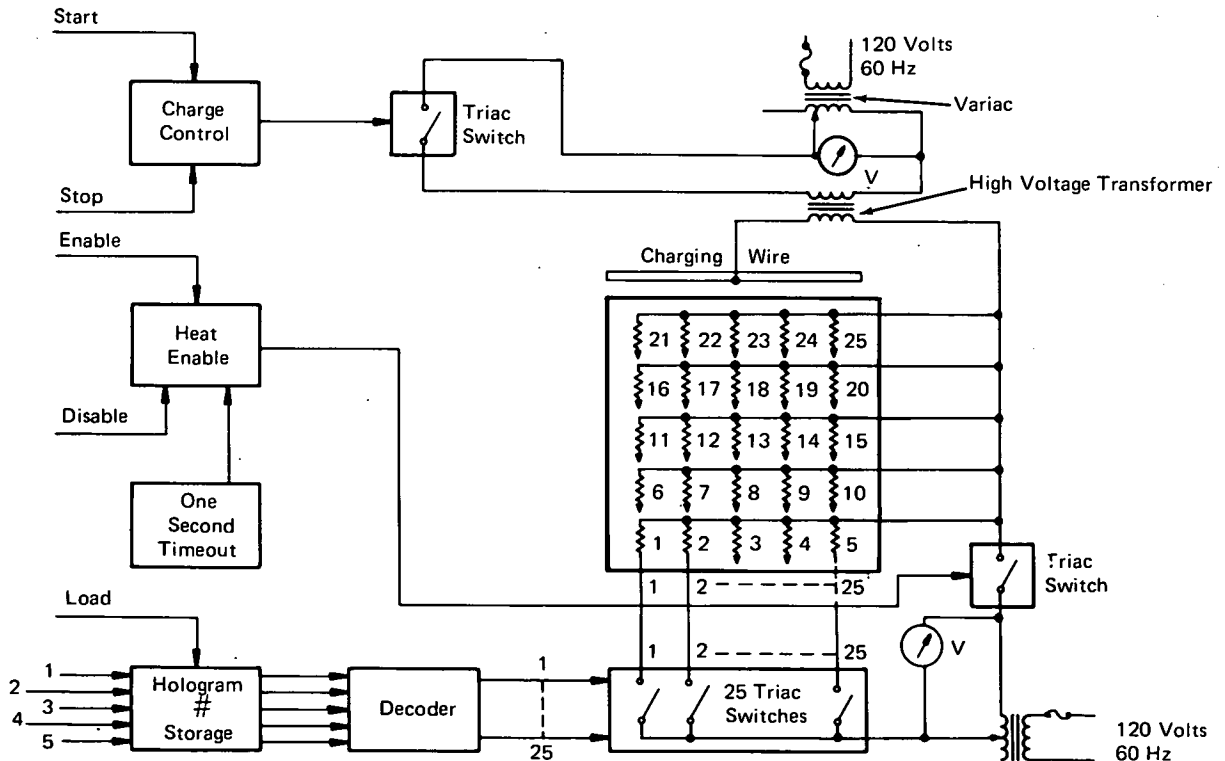


Figure 1.

(continued overleaf)

a.c. power source. The two heavy wires protruding from the center of the fixture are used to connect the corona discharge device to a high voltage d.c. power supply.

To record holograms on the photoplastic material, the photoplastic surface is charged; the surface with the information to be recorded is illuminated; and the resistive pads are heated to develop the surface relief. Erasure of a hologram requires heating the pad to a temperature which allows the charge to dissipate and eliminate the surface relief.

transparent electrode strips on the top and bottom faces of the PLZT can be provided in several ways. One approach is to extend the electrodes to the four edges of each block so that electrical interconnections with adjacent modules can be made by fitting them together with slight pressure. In this method the drivers connected to the electrodes on modules around the BDC periphery are connected to full rows and columns.

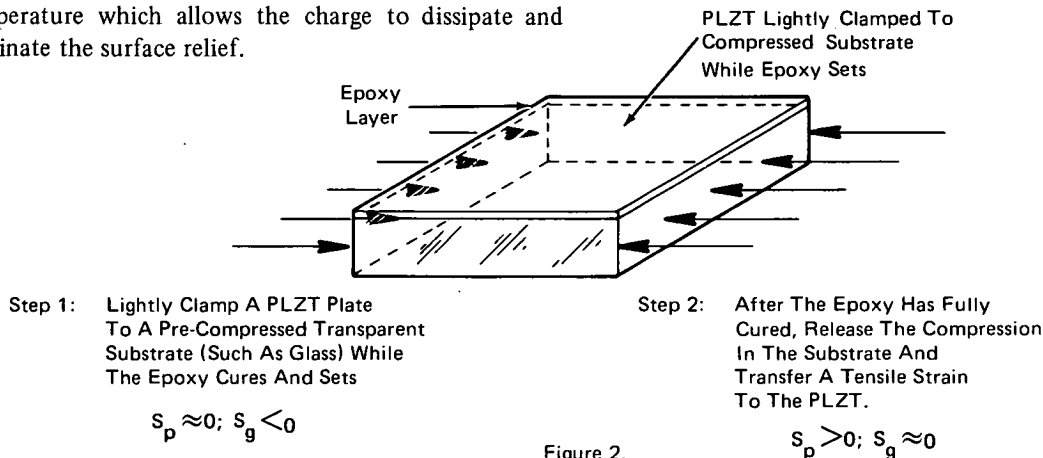


Figure 2.

In fabrication of block data composers, a linear strain biased PLZT (lanthanum-doped zirconium titanate) is used. The block data composer (BDC) is an addressable matrix PLZT device that converts an electrical digital signal into an optical two-dimensional signal that spatially modulates a laser beam. A technique has been developed for producing a linear strain-bias (no curved surfaces). The ability to easily vary the strain-bias level is lost, but the compactness, flatness, and ruggedness of the structure offset this disadvantage in the final device. The technique takes advantage of the fact that glass or fused quartz can tolerate high levels of compressive strain (higher than steel) without cracking. A glass or fused quartz block is placed in a special jack and compressed until the compressive strain (relative dimension change) is equal to the tensile strain required in the PLZT plate. A PLZT plate is then epoxy-bonded to one of the strained faces (Figure 2). After the epoxy sets, the compressive force on the quartz block is released; a linear tensile strain is, thereby, developed in the PLZT. The resulting structure is compact and flat.

The optical quality of quartz blocks can be extremely high at a modest cost, since the state-of-the-art in glass and fused quartz preparation is highly developed. The blocks can be trimmed with a diamond saw so that the PLZT plate completely covers one face of the block. This feature is important because it permits a large BDC to be assembled from small modular BDC's while maintaining regular element center spacings, even across module intersections. With this technique, access to the

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The use of precompressed glass or fused quartz for strain biasing the PLZT is a potentially useful procedure in the development of larger BDC's.

Notes:

1. Information concerning this Tech Brief may be of interest to the designers and manufacturers of data storage and presentation equipment and systems.
2. Requests for further information may be directed to:
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Marshall Space Flight Center
Code A&PS-TU
Marshall Space Flight Center, Alabama 35812
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Patent status:

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Code A&PS-PAT
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