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NASA TECH BRIEF

Marshall Space Flight Center

Solid-State Data Interpretation System: A Concept

An all solid-state substitute for the cathode ray tube has been conceived. The device could find application in computer input-output devices such as microfilm readers, optical page readers, and data displays.

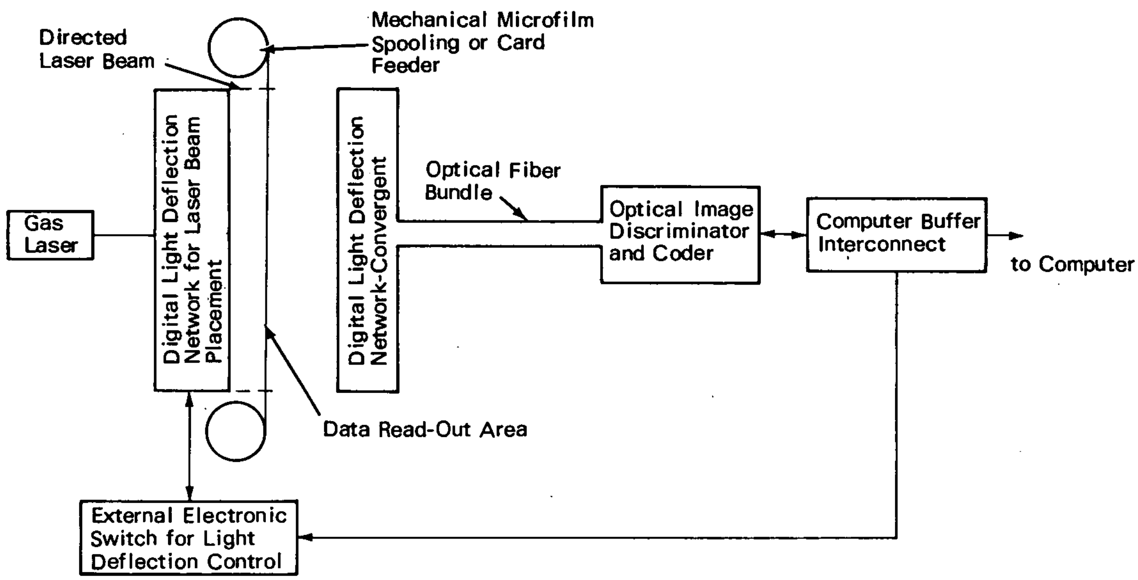

Figure 1. Solid-State Data Read-In Device

The concept could be applied in a nonmechanical computer input device with data reading and interpreting capability approaching the operational capability of a modern digital computer. Information stored on microfilm would be scanned, and the resulting images of alphanumeric characters discriminated and converted into digital form. The device, shown schematically in Figure 1, would be analogous to a magnetic tape reader, with microfilm representing the magnetic tape and a light deflection network and optical image discriminator replacing the pickup head. A laser beam would scan the microfilm surface in a predefined pattern. Either the reflected or the transmitted images of the alphanumeric characters would be focused onto a bank of light deflection switches. The converged light beam would be optically piped into an optical image discriminator and coder for conversion into computer language.

The concept could also be applied in a solid-state data display device, as shown schematically in Figure 2. This device would be analogous to a cathode ray tube, with the laser representing the electron gun and the light deflector switches replacing the controlling fields. The computer buffer would generate the sequencing information necessary to indicate placement of alphanumeric characters

(continued overleaf)

on the display image area. The buffer/display interconnect would interpret the bit pattern arriving from the computer buffer, and would set the necessary switches in the digital light deflector network so

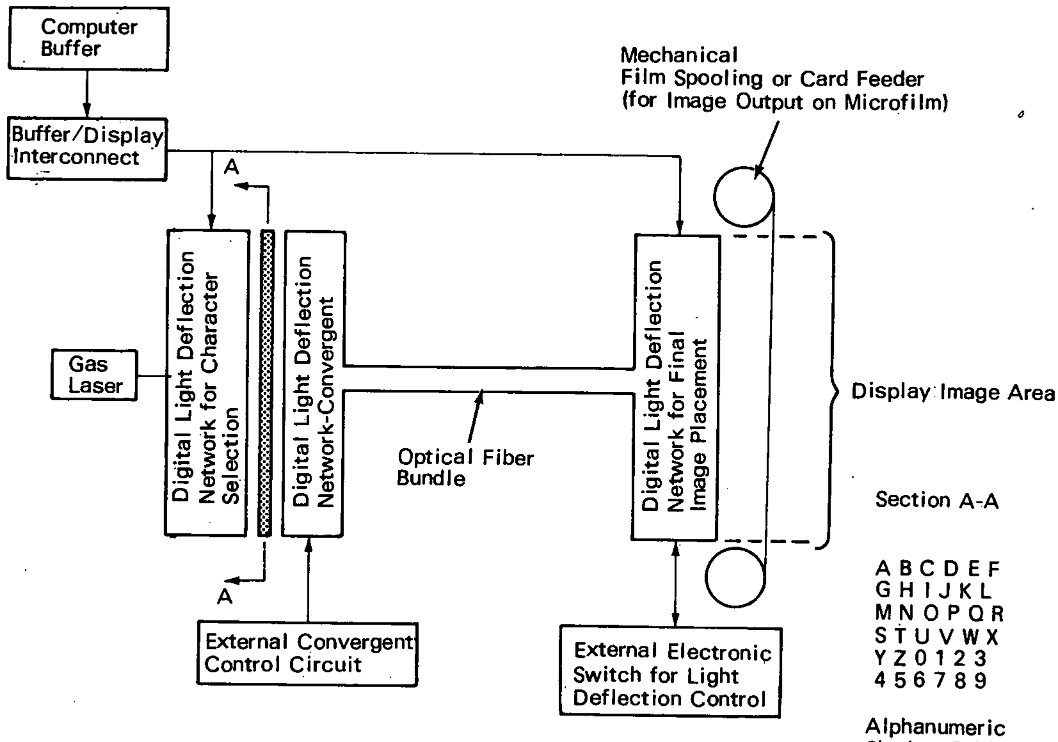

Figure 2. Solid-State Data Display Device

that the laser beam would pass through the proper element of a standard alphanumeric shadow grid. An external convergent control circuit would maintain the necessary switching to cause all of the character images to converge at a central point. These images would then be fed into an optical fiber bundle, incorporated to allow flexibility in component placement.

At the output of the fiber bundle, the images would pass into another digital light deflection network for final image placement on the display area. The external electronic switch controlling this network would operate in a fixed switching mode, resetting on page-change pulses received from the buffer/display interconnect.

The heart of these devices, the digital light deflector, would be a network of solid-state light switches. Based on the Pockels cell, these switches would consist of potassium dihydrogen phosphate (KDP) and calcite crystals. The KDP crystals would be covered with semitransparent electrodes, allowing a control voltage to govern the rotation of the laser beam's polarization plane. The birefringent calcite would either pass the laser beam straight through or deflect it by about $\pi/30$ rad (6°), depending on the orientation of the beam's polarization plane. Banking these optical switches would permit the light beam to be directed to any specified point within a grid.

Each of the proposed devices would operate at speeds comparable with those of a modern, high-speed computer. Assuming character generation or interpretation times of approximately one microsecond, about fifteen complete computer printout pages could be generated or interpreted during each second of operation.

Note:

Requests for further information may be directed to:

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No patent action is contemplated by NASA.

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