

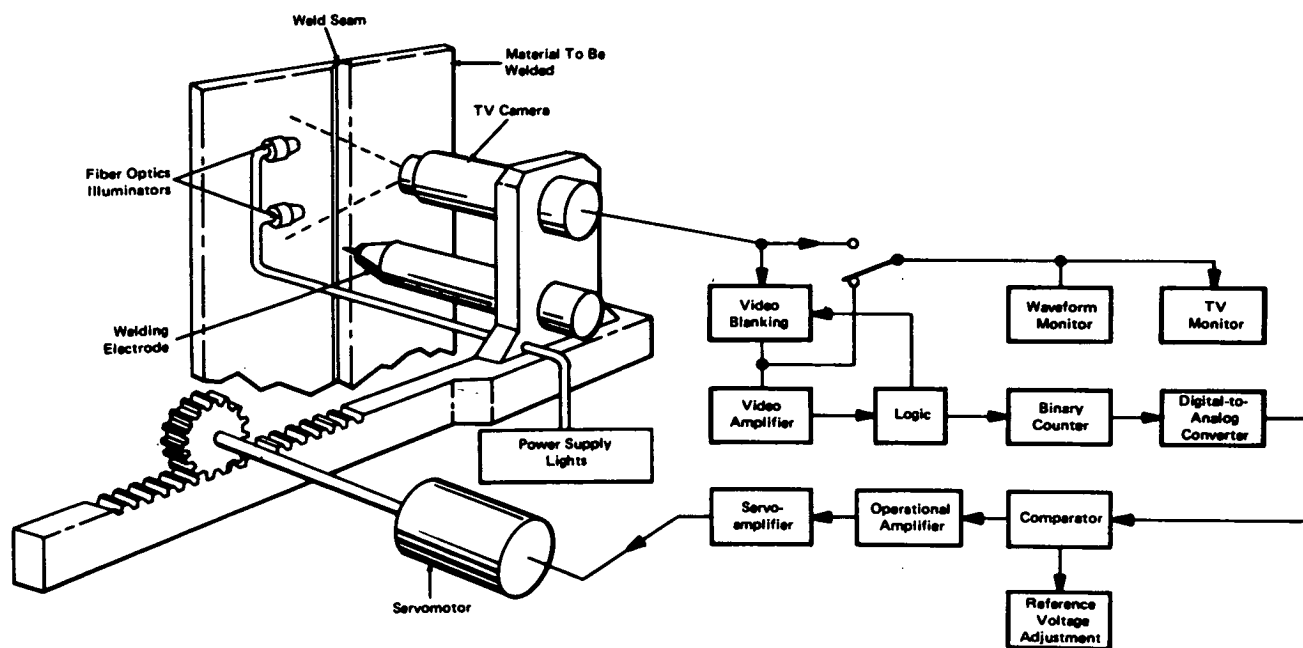
NASA TECH BRIEF

Marshall Space Flight Center



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Closed-Circuit-Television Welding-Electrode Guidance System



Welding-Electrode Guidance System Block Diagram

A closed-circuit-television welding-electrode guidance system was developed and evaluated. The guidance system shown in the illustration is designed to guide a welding electrode along the weld seam within a ± 0.76 -mm accuracy. A closed-circuit TV camera is mounted parallel to the electrode and moves along with it. The camera is scanned along the seam so that the seam is viewed parallel with the scan lines on the TV monitor. Two fiber optics illuminators are also attached to the guidance system; they illuminate the seam for the TV camera.

In operation, the composite video signal from the TV camera is routed to both the waveform and TV monitors and from there to a special blanking circuit for the removal of unwanted portions of the signal. Next, the

signal is amplified to raise its voltage and power to a level that can be used by the logic section. Logic circuits separate the video information from the synchronizing pulses to feed a binary counter. The control in the logic is such that the counter will begin receiving pulses at the top of the TV scan, and it will count each successive horizontal scan line until the bright line of the illuminated weld joint is sensed. This stops the counter on that particular horizontal line number. The number is stored in a flip-flop register until new information is fed into it during the next scan.

The stored horizontal line number in the register is periodically fed to a digital-to-analog converter (DAC) for conversion into a proportional dc voltage. This dc voltage analog of the stored number is then algebraically

(continued overleaf)

summed with a reference voltage. If the output dc voltage level is either less than or greater than the reference voltage level, a positive or negative dc error signal is transmitted to the servoamplifier, which drives the motor to position the camera electrode holder horizontally until the error difference is canceled. The sign of this error signal to the servoamplifier determines the direction of the horizontal movement.

The dynamics of the servomotor are such that new error information is received much more rapidly than the vertical movement of the electrode holder. Since the TV field is scanned 60 times per second, the DAC receives new tracking data each 1/60th of a second. This rapid supply of position information allows the servosystem to guide the welding torch accurately along the weld centerline.

Note:

Requests for further information may be directed to:
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NASA has decided not to apply for a patent.

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