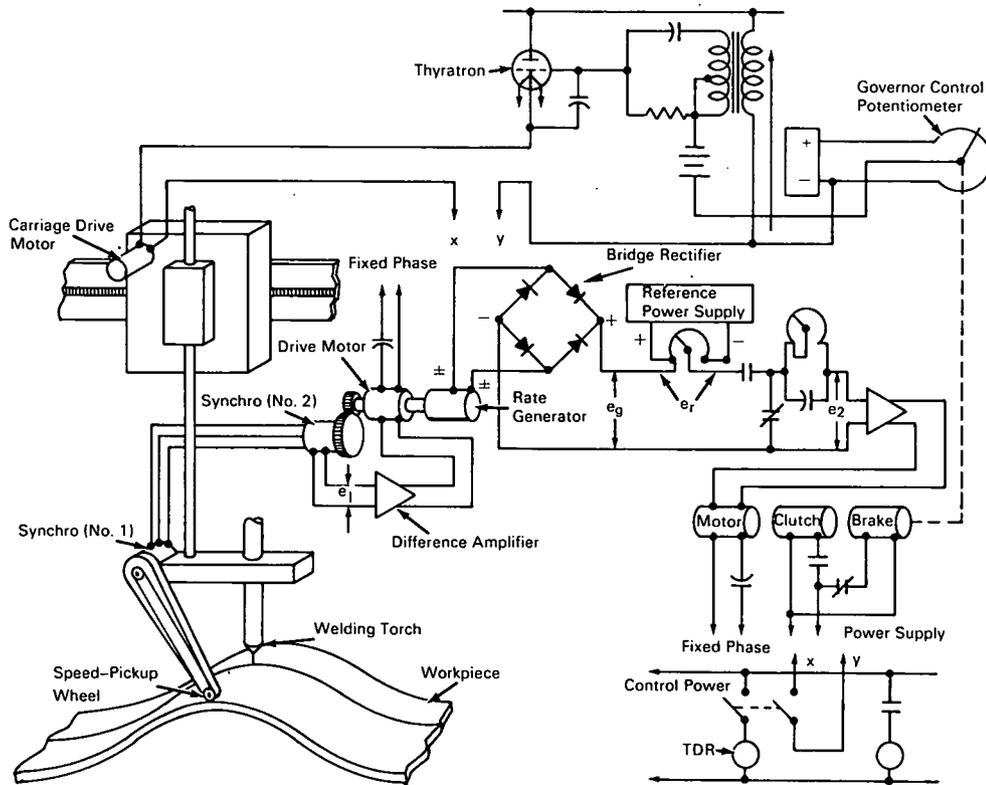


NASA TECH BRIEF



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Automatic Contour Welder Incorporates Speed Control System



A speed control system has been designed to maintain the welding torch of an automatic welder at a substantially constant speed. The system is particularly useful when welding contoured or unusually shaped surfaces, which cause the distance from the work surface to the weld carriage to vary in a random manner.

The system uses a speed pickup wheel to sense the instantaneous speed of the welding torch carriage. The speed of the carriage is converted into a smooth voltage output by a tachometer or rate generator.

The latter is isolated from the speed pickup wheel by a closed loop servo system which includes a pair of synchros, a difference amplifier, and a drive motor. The output from the rate generator is compared with a preset reference voltage which represents the desired welding speed. The resulting difference voltage controls the input to a thyatron governor which, in turn, varies the speed of the weld carriage drive motor.

Operation of the system is explained with reference to the circuit schematic as follows: The speed sensed by the pickup wheel is fed mechanically to a set of

(continued overleaf)

synchros (No. 1 and No. 2). Synchro No. 1 feeds an error signal e_1 through synchro No. 2 and a difference amplifier to a drive motor. This motor rotates synchro No. 2 in such a direction as to reduce the error signal. Thus, synchro No. 2 closely tracks the first synchro through an integral feedback servo amplifier. The drive motor drives the rate generator which produces output voltage e_g , representing the instantaneous speed of the weld torch tip. This voltage passes through a bridge rectifier and is bucked against a reference voltage e_r from the reference power supply. The resulting difference voltage e_2 is amplified and fed through a motor, a clutch, and a brake to the governor control potentiometer and a thyatron governor. The governor controls the speed of the carriage drive motor, so that the tip of the welding torch moves at a substantially constant speed with respect to the work-piece. When the system is started, the governor is controlled by a time delay relay (TDR) which allows 1.5 seconds for the weld carriage speed to stabilize before the automatic speed control takes over. During

this period, the brake is engaged while the clutch is disengaged.

Notes:

1. The innovation is in the motor-driven rate generator which is controlled by a separate feedback amplifier loop and the motor-clutch-brake arrangement for controlling the electronic motor governor.
2. Inquiries concerning this system may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B68-10091

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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