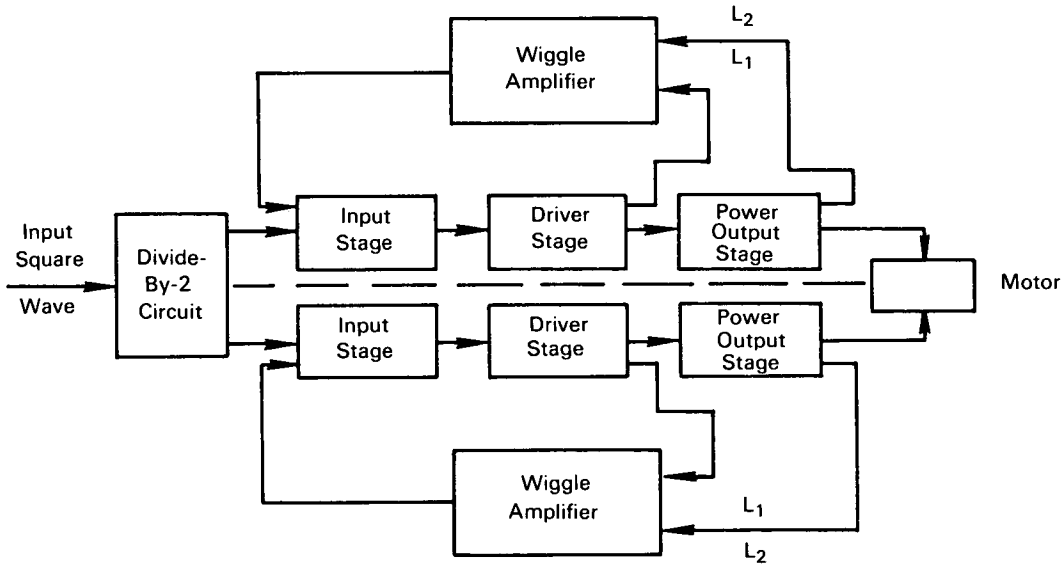
NASA TECH BRIEF

Stepping Motor Drive Circuit Designed for Low Power Drain



The problem: To eliminate high power drain and variations in mechanical load, temperature, and supply voltage from a stepping motor drive circuit system.

The solution: A stepping motor drive circuit design, incorporating a switch with less than 1-volt drop when conducting, and minimal leakage of microamperes when nonconducting. Each drive pulse causes a step, with power drain close to zero when the motor is stopped in an equilibrium position.

How it's done: The circuit consists of a divide-by-two stage, and two identical input, wiggle amplifier, driver, and power output stages to drive the motor through a brief operating cycle.

The divide-by-two applies square waves (180° out-of-phase) to the input stages. With L_1 connected, the input, driver, and wiggle amplifier form a one-shot multivibrator. When the waveform at the input goes from positive to negative, this multivibrator locks on and the power output stage conducts. An RC network discharge in the input causes conduction in that stage, and the multivibrator becomes regenerative in the opposite direction. The circuit then reverts to its original state, and the power output stage turns off.

This procedure is repeated when L_2 is connected, but turnoff is not determined by the RC network. When the motor steps, a wiggle is generated in the power output stage, amplified in the wiggle amplifier, and fed back to the input stage as a positive pulse. The input stage then turns on, the multivibrator becomes passive, and the power stage turns off.

If the motor freezes, no wiggle appears, and the RC network turns off the circuit.

(continued overleaf)

Notes:

1. Adaptations of this switching device may be of interest in relay circuitry design.
2. Step motors are suitable as rotary actuators in a variety of small positioning control systems, particularly where the overall system is digital.
3. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Goddard Space Flight Center
   Greenbelt, Maryland, 20771
   Reference: B65-10026

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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