A SIMPLE SPARK EROSION MACHINE

The Spark Erosion Machine with the front cover removed and minus the electrolyte container.

Eric Rumbo outlines a device which avoids complex control electronics

Background

Some time ago, the author experienced that most distressing of mishaps, a broken tap in an almost completely machined casting. After some futile attempts at mechanical removal it was clear that the only method likely to succeed would be spark erosion. But could a Spark Erosion Machine (SEM) be built quickly and cheaply enough to justify its construction? Most SEMs employ a servo-mechanism to position the cutting electrode over the workpiece. The version described by Peter Rawlinson which utilised a stepper motor for downfeed, and published in MEW, issues 57 to 60, attests to the complexity of the electronics and other design features required to achieve this. At that stage, the elegantly simpler version given by Geoff Oakes in MEW issue 104 had not been published.

Fortunately the author remembered a demonstration some years earlier by a fellow model engineer, Trevor Dowling, at the Canberra Society of Model and Experimental Engineers of a much simpler design. Instead of a servo mechanism his machine used a reciprocating plunger, driven by a solenoid, to which the cutting electrode was attached, **Fig. 1**. The voltage to the electrode was applied through the solenoid winding so that when the electrode made contact with the workpiece current flowed through the solenoid lifting the electrode off the workpiece only to fall back as the circuit was broken. The momentary contacts between electrode and workpiece produced the metal eroding spark. No active electronics were involved and the machine was simple enough to be put together in a few days. Another advantage of the design was that the piston action of the electrode also dispersed the debris produced by the cutting so that for small jobs a circulating pump was not necessary. The electrolyte could be filtered later for re-use.

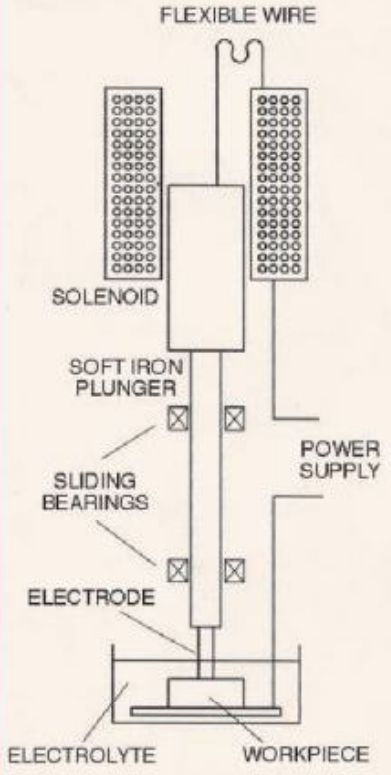
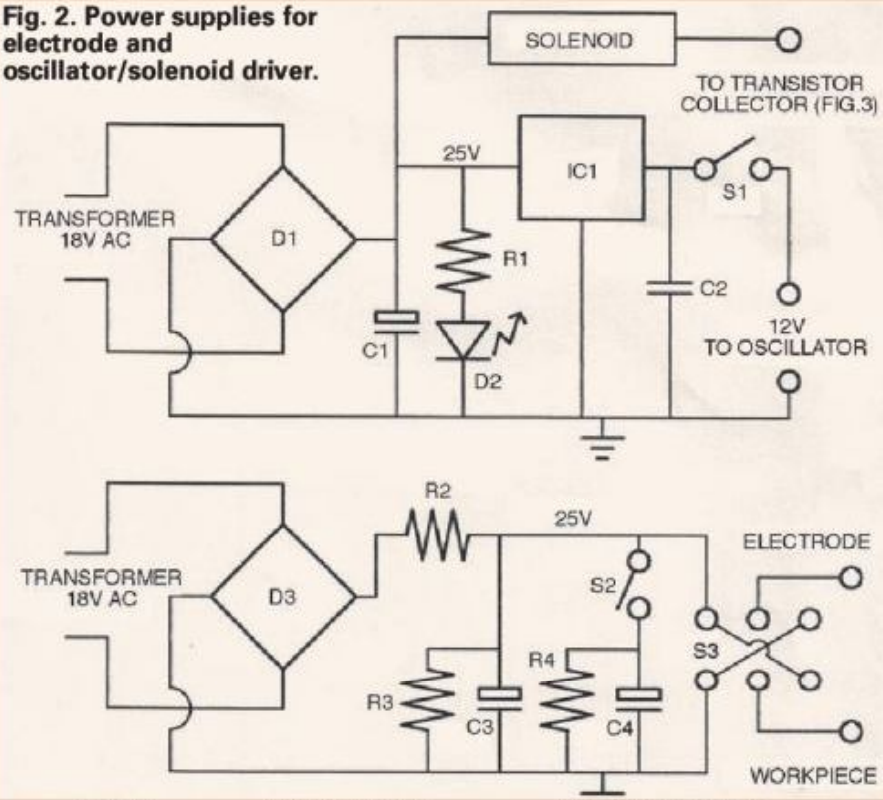


Fig. 1. Design concept for a reciprocating plunger spark erosion machine.

Fig. 2. Power supplies for electrode and oscillator/solenoid driver.



RI - 6K8	CI - 2500 µF, 35V	D1 - 1A Diode Bridge
R2 - 20	C2 - 0.1 µF	D2 - Red LED
R3 - 10K	C3 - 470 µF, 200V	D3 - 4A Diode Bridge
R4 - 10K	C4 - 470 µF, 200V	S 1 -Switch, Toggle
1C1 - 7812	S2 - Switch, Toggle	S3 - Switch, 2 pole 2 way