CAUTION! CAUTION! THIS PROJECT CAN CAUSE SERIOUS INJURY! DO NOT ATTEMPT UNLESS FULLY FAMILIAR WITH THE HANDLING OF FLAMMABLE MATERIALS AND HIGH VOLTAGE - INTENDED FOR EDUCATION USE ONLY!

PFM1

PFM1 - CHEMICAL/FLAME PEST ELIMINATING DEVICE

The following plans show how to construct a hand-held device intended for burning out insect nests such as wasps, ant hills, cocoons, maggots, tent caterpillers, gypsy moths etc. It may also be used to ignite rubbish piles, brush, leaves etc. This device like many with similar use and capability can be a very dangerous weapon in the wrong hands. It should not be assembled unless the builder is thoroughly aware of the hazards involved.

Range of this device is dependent on the chemical and nozzle heads used. Usually a tight stream can have a range in excess of 20' (similar to a toy water pistol) while a wide vaporous stream may only be effective up to 5' but can create a virtual wall of fire and flame (CAUTION! CAUTION! A WIND OR STIFF BREEZE BLOWING TOWARDS THE USER CAN PRODUCE DISASTROUS RESULTS WITH THE STREAM BEING IN THE FORM OF A MIST).

Fuel for the device can be a small pressurized can of WD40 lubicant or be the more flammable, Ether, similar to that used for starting stubborn gas engines. The latter can be extremely hazardous both to the user and his surroundings as ether has a low flash temperature and is highly explosive and flammable.

THEORY OF OPERATION REF FIGURES 4,5,6,7

Construction is shown as a pistol configuration with the fuel source (FUC1) being placed in the handle (HA1) and the electronic ignition along with the battery housed in the rear of the barrel (BR1) see FIG 7. When (AA1) actuator arm activates (S1) contact along with the valve on the fuel source (FUC1) the fuel now spews out of nozzle (NOZ1). (S1) energizes the ignitor and a spark discharge at electrodes (EL1,2) ignite the fuel stream. The ignitor conists of the inverter power supply and the high voltage capacitor discharge section. See FIG 1, 2, 3.

The INVERTER SECTION consists of switching transistors (Q1) and (Q2) that alternately switches the primary windings of a saturable core transformer (T1). A high voltage square wave is induced in the secondary of T1 via this switching action and is rectified by diode bridge D3, 4, 5 & 6. Base current drive for Q1 and Q2 is obtained by a tertiary feed back winding on T1 and is applied in the correct phase to turn the appropriate transistor "on". This base current is limited by resistor R2. Diodes D1 and D2 provide a return path for the base current flowing in the opposite transistor respectively. R1 serves to unbalance the circuit to initiate switching. A voltage of approximately 400 volts is obtained in this circuit from the 9-volt Ni-Cad battery B1. Higher powered operation may be obtained by increasing B1 to a 12-volt battery pack, however, more space is required and care must be taken not to over rate the components if continued use is anticipated.

Please note that the electronic ignitor IGN3 for your flame thrower is described in detail referencing certain parts and pieces. Because of its complexity we offer it as an assembled and tested item.

The mechanical parts are indicated on a separate sheet and are those used for our laboratory prototype. Rather than explain the particular pieces we used we will describe their function instead so that the builder may use his own ingenuity in constructing various configuations of this device.

FUC1 - The fuel can may be a fresh can of appropriate size depending on the builder's desires. We used a oz. can of WD40 available through your local hardware.

CAUTION! we must warn the builder of the hazards involved using WD40 or other chemicals. Certain low flash point solvents and fuels must be treated with caution! FIG 4 shows a reusable can filled with a pressure valve for recharging. For maximum results a freon gas must be used as a propellant as compressed air will not liquify at the low pressures used.

CO1 - Small piece of copper soldered to can as shown FIG 4,5,6 for switch contact abutting screw and spring combination.

AA1 - Actuation arm can be any suitable insulating material that can be easily worked as shown FIG 5. We used a plastic tuning wand and fabbed it as needed.

CA1, 2 - Shims so that can will fit into appropriate enclosure. May use layer of glass tape etc.

SPR1 - Small spring and screw/nut combination for contacting CO1 copper abutment plate. We used spring found inside of a ball point pen.

BLK1 - PVC head block must be insulated material and snuggly fit into BR1 barrel. We used a block of PVC drilled and tapped for nozzle screw and plastic tube TUB1 from fuel can.

NOZ1 - Nozzle screw 6-32 X ¼" soft metal for drilling a .05 hole lengthwise The metal face protects the plastic head block from the flame.

HA1 - Handle appropriate size of plastic or metal tubing. We used a 2" OD plastic pipe with ¼" wall.

BR1 - Main enclosure same material as handle. Select for easy fabrication.

IGN3 - ELECTRONIC PARTS LIST PFM1

R1,3	(2)	10 K 1/4 watt resistor
R2	(1)	1 K 1/4 watt resistor
R4,5	(2)	100Ω 1/4 watt resistor
R6	(1)	100 K trimpot or pot
R7	(1)	2.2 K 1/4 watt resistor
C1	(1)	10 ufd/25 V elect cap
C2	(1)	.1 to .3 ufd 400 V metallized paper capacitor
C3	(1)	1 ufd/50 V elect cap
D1,2	(2)	IN4001 50 to 100 V diodes
D3,4,5,6,7,8	(6)	IN4007 1000 volts diodes
Q1,2	(2)	PN2222 NPN plastic transistors
Q3	(1)	2N2646 unijunction
SCR1	(1)	C107D 400 V SCR GE
T1	(1)	Type III transformer.............$14.50
T2	(1)	11 KV CD....Assembled & tested...$14.50
S1	(1)	SPST push button switch (not used PFM1)
PB1	(1)	Perfboard 4¼x1½ .1 grid
CL1	(1)	Battery clip
		Hook up wire #24 plastic hook up
		#24 buss wire
COR3	(1)	Ultra small cores for winding T1 yourself
BOB3	(1)	Ultra small bobbin for winding T1 yourself

(Wire for T3 must be obtained through supply house as it is too difficult to handle for shipping in small amounts).

IGN3K.............Kit of Above Ignitor Parts.................$24.50

IGN30.............Assembled as Shown..........................$34.50

B1.........Optional 9 Volt Nickel Cadium Battery.............$ 9.75

BC9........Dual Charger/Eliminater for Above Battery.........$19.50

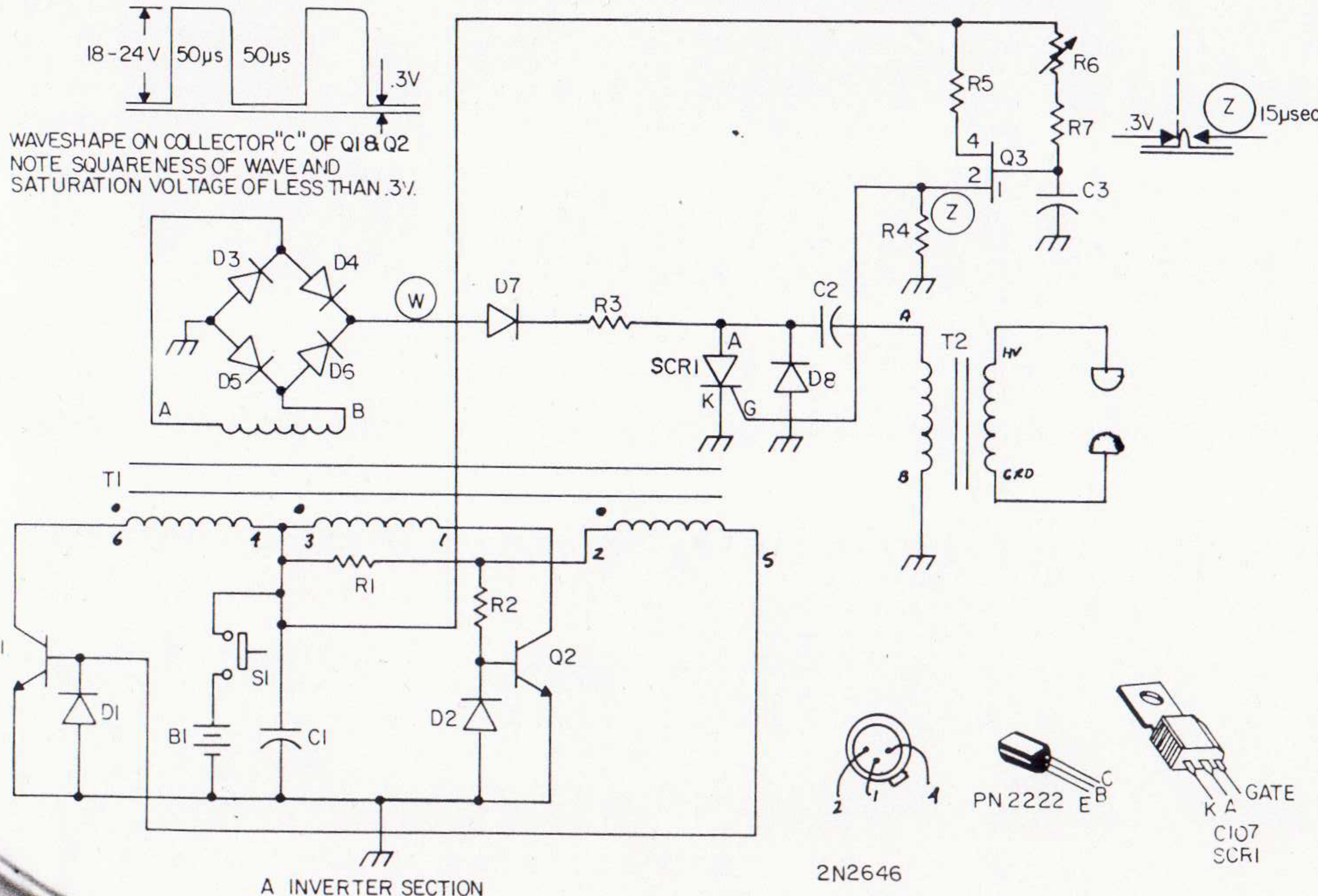
PFM1 - MECHANICAL PARTS LIST (Note-these are the materials we used for the lab prototype-You may use your own ingenuity)

* FUC1	(1)	Fuel can (see text) FIG 4
CV1	(1)	Check valve for pressurizing-Also obtain removal tool for insert. Use tire type or mating fittings to charging supply.
CO1	(1)	Copper contact plate small piece of thin copper
CA1,2	(2)	1-½" plastic caps
AA1	(1)	Plastic actuator arm use tuning wand or equivalent
SPR1	(1)	Small spring from ballpoint pen or equivalent
SW1/NU1	(1)	4-40 X 3/4" screw and nut
LUG1	(1)	Small solder lug
WR1	(1)	#24 hook up wire
WR2	(1)	#18 buss wire for spark gap electrodes
BLK1	(1)	PVC block 3/4 X 1 X 1 1/4 Fab per text FIG 6
NOZ1	(1)	6 -32 X ¼ aluminum or brass screw Fab per text FIG
HA1	(1)	Handle
BR1	(1)	Enclosure
BK1	(1)	Bracket
SW2	(1)	Screws

* Consult aerosol can manufactures in your area.

Reference United States Patent #4,220,443

FIG-1,2,3 POWER BOARD,SAME AS FIG 1,2,3 ON SD5



PFM1 FLAME THROWER IGNITOR SCHEMATIC

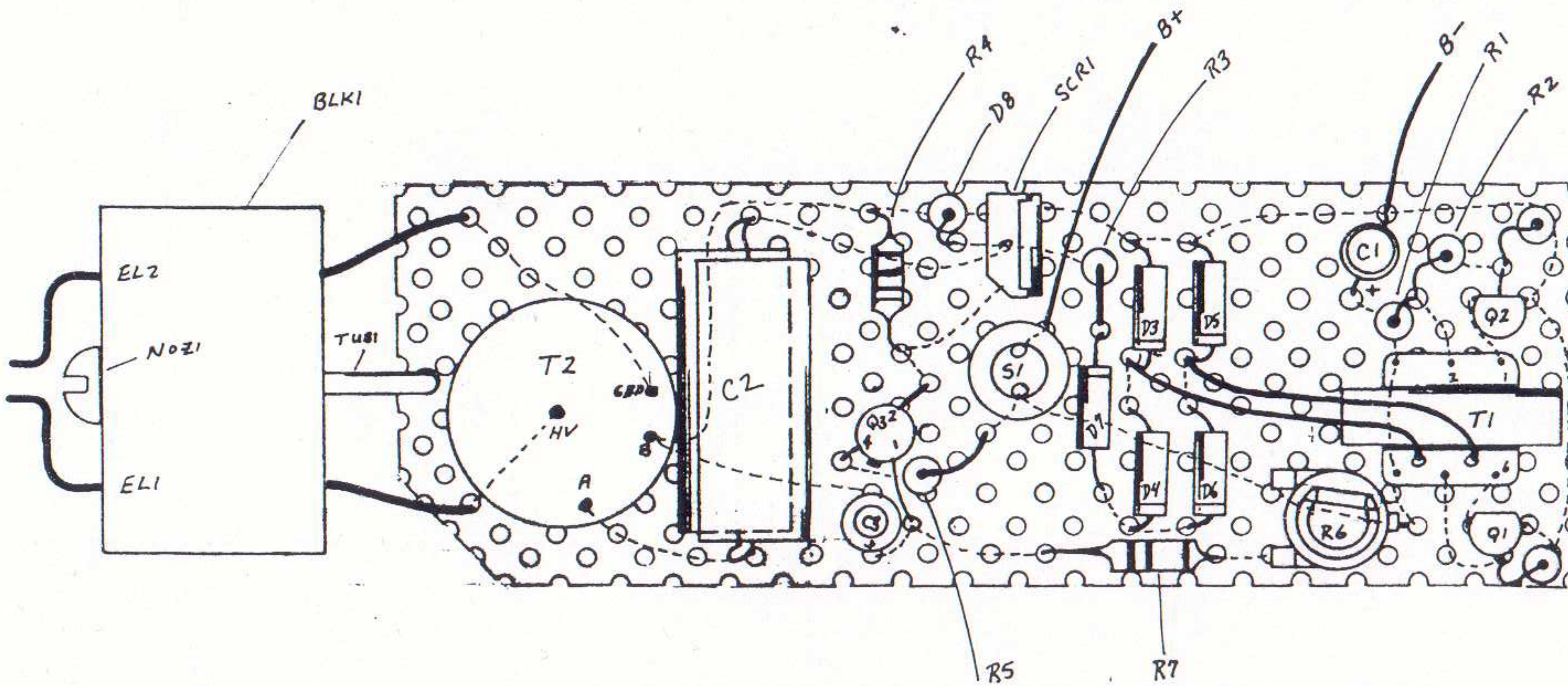
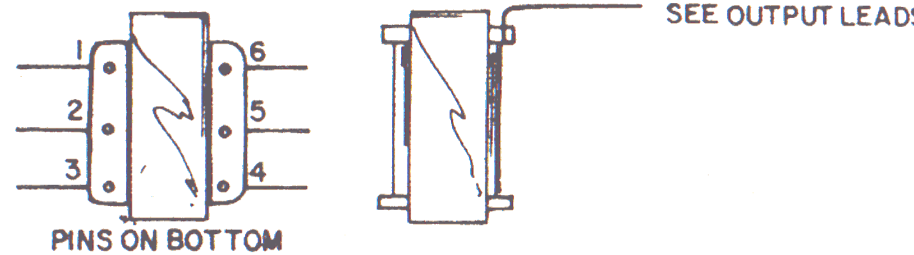


FIG 2 - POWER BOARD PICTORIAL LAYOUT

1. WIND 400 TURNS # 34 WIRE FOR SECONDARY—LEADS BREAK OUT THRU HOLES IN BOBBIN. INSULATE FROM PRIMARY FOR 1000 VOLTS.
2. WIND 15 TURNS # 30 WIRE AND BREAKOUT TO PINS 2&5. BIFILAR WIND 15 TURNS # 26 AND BREAKOUT AS SHOWN—PINS 1,3,4,6.

NOTE: DOTS ON WINDING INDICATE "START".



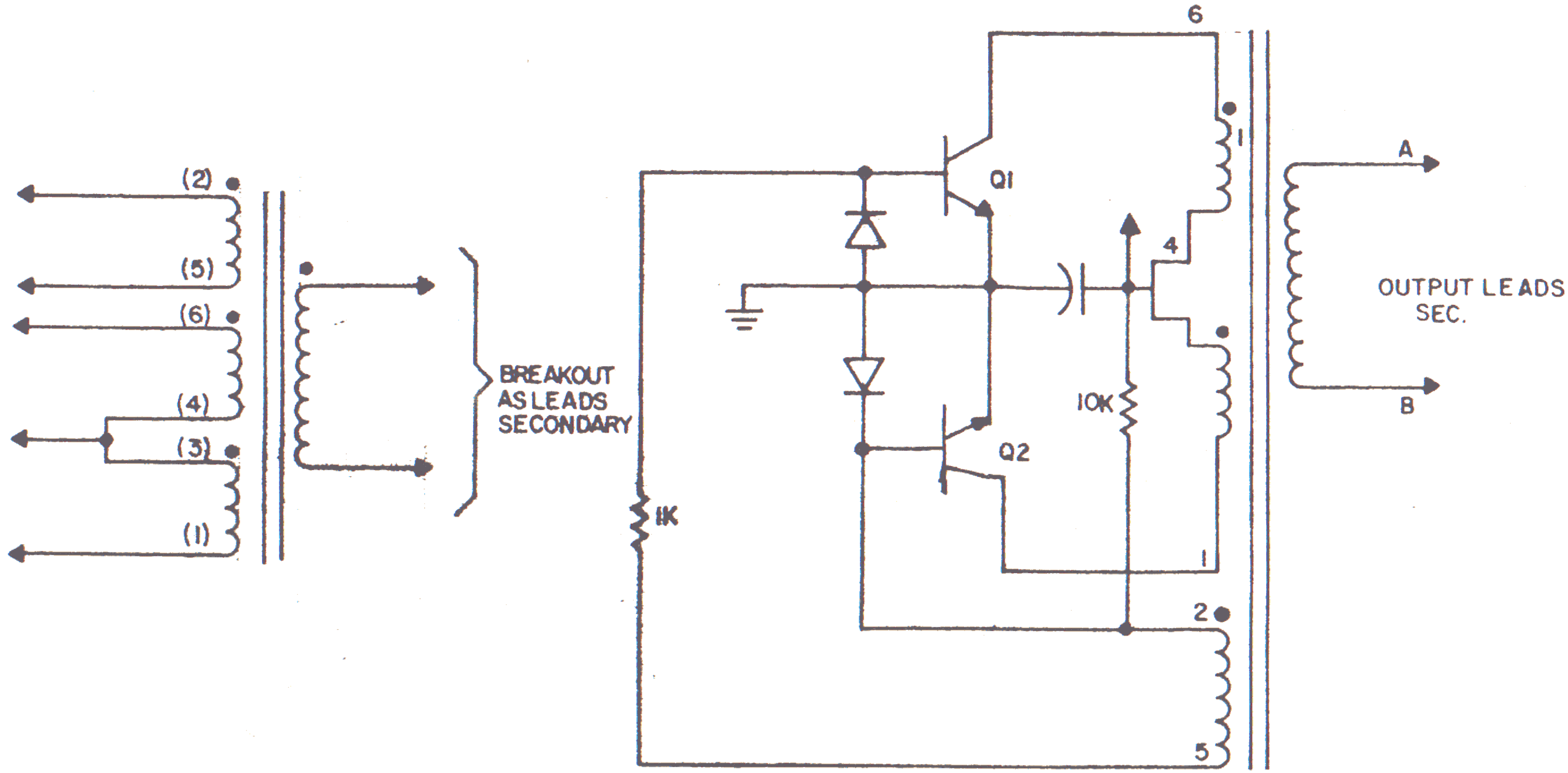
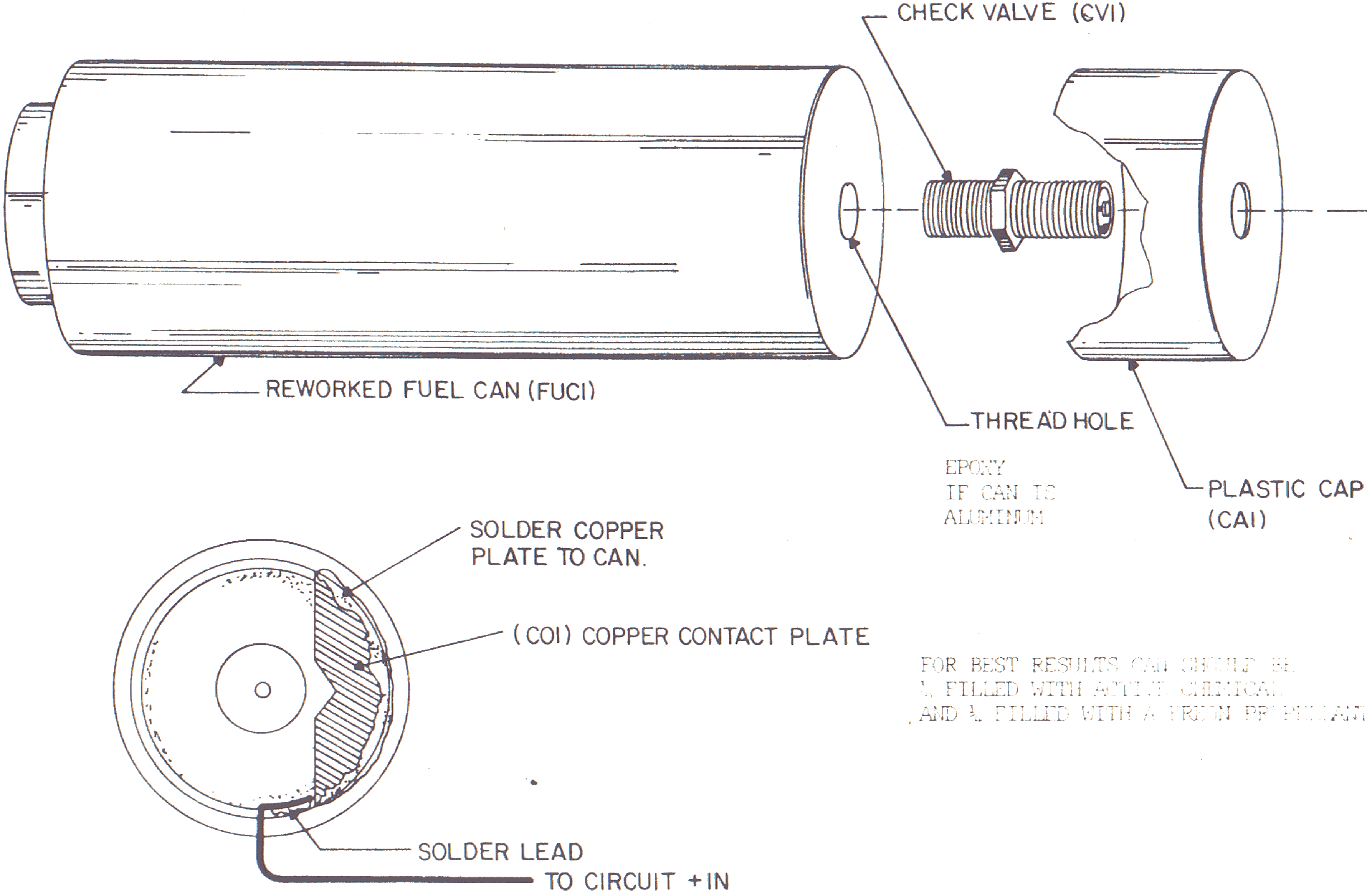


FIG-3 TRANSFORMER TYPE III

FIG-4 REWORKED FUEL CAN
FOR RECHARGING



FOR BEST RESULTS
FILLED WITH
AND FILLED WITH A

FIG-5 DETAIL OF VALVE ACTUATOR AND SI SWITCH

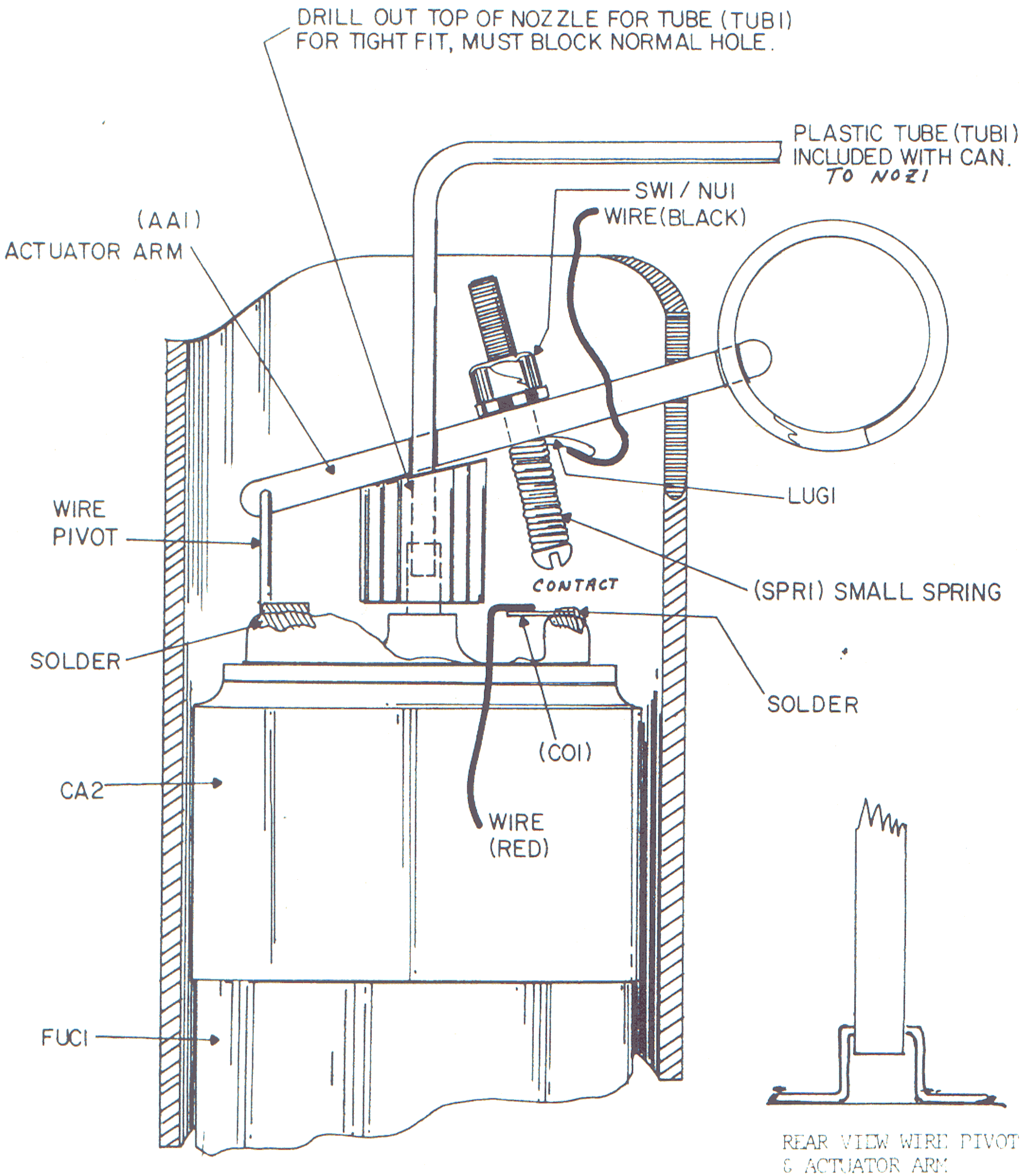
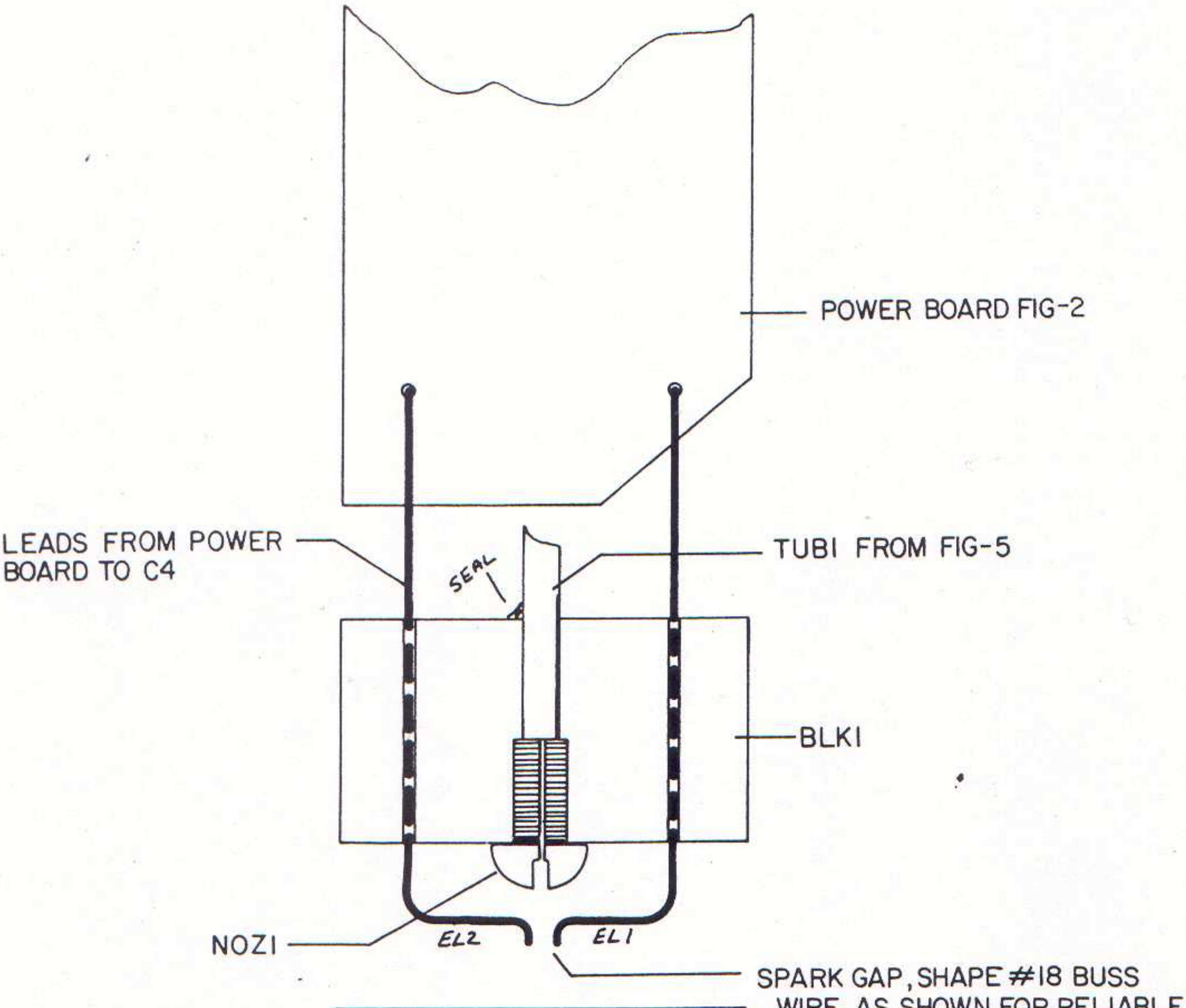
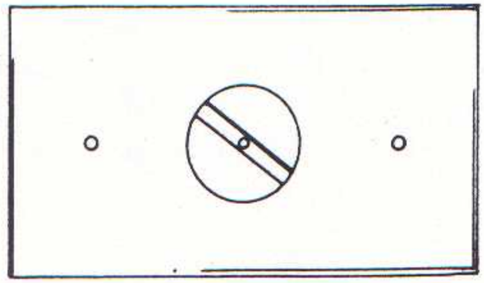


FIG-6 NOZZLE AND BLOCK ASSEMBLY

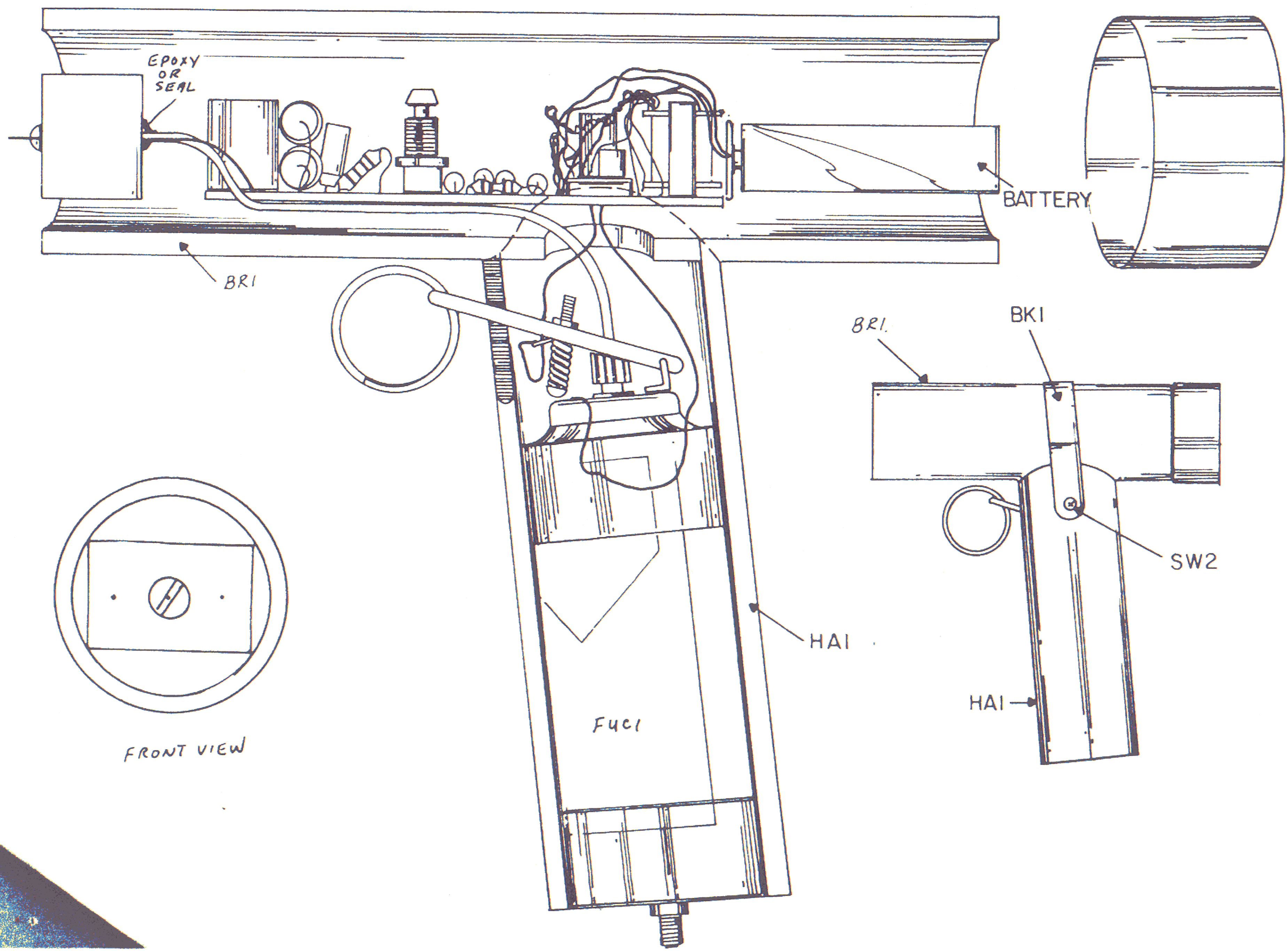


DRILL SMALL HOLE THRU ENTIRE LENGTH OF SCREW USE HIGH SPEED DRILL #50



FRONT VIEW

FIG-7 FINAL ASSEMBLY



The CAPACITOR DISCHARGE SECTION consists of a high voltage pulse transformer T2, FIG 1, 2 being current pulsed via SCR1 shorting a charged capacitor C2 across its primary. C2 and the primary inductance of T2 provides a ringing wave whose negative overshoot commutates SCR1 to turn "off". It is important that this primary inductance be sufficient so when combined with capacitor C2 allows a ringing frequency with a period considerably larger than the required commutation turn off time of the SCR1. Diode D8 provides energy recovery of the negative overshoot component of this discharge pulse.

Transformer T2 now force induces a very high voltage pulse in its secondary with a high instantaneous peak current (this system is similar to a Capacitor Discharge Ignition). Diode D7 and R3 limit the DC current to the SCR1 and prevents DC lock on, while also providing a high impedance to the negative turn "off" pulse.

SCR1 is triggered by the UJT pulse timing circuit consisting of Q3. Pulse repetition rate is determined by capacitor C3 and the charging resistor R6. SCR1 switch rate can be adjusted "from one to ten pps". Higher pulse rep rates may have a tendency to overload the inverter power supply, where it will be unable to supply the current necessary to successfully charge C2, consequently with its charge voltage dropping off.

The voltage output of T2 is well over 10,000 volts at a peak current of 1-2 amps. The energy wave forms consists of a train of 20 microsec pulses decaying exponentially. This spark discharge occurs at elecrode EL1, 2 and ignites the fuel stream as it exits the NOZ1.

ASSEMBLY OF POWER BOARD REF SCHEMATIC FIG 1 AND PICTORIAL LAYOUT FIG 2

1. Layout and identify all parts and pieces.

2. Assemble T1 as per Type III transformer instruction sheet or obtain an assembled & tested unit from INFORMATION UNLIMITED. See parts list.

3. Fabricate PB1 as shown from a (4¼" x 1½") piece of perfboard or use optional PC board #PCPWB1. Note holes for push button S1 switch when used, being enlarged.

4. Insert and wire components as shown. Avoid wire bridges and use component leads wherever possible. Follow layout FIG 2. Observe polarity of diodes, semi-conductors and capacitors. Always leave at least 1/16 to 1/8 leads on semi-conductor so they do not sit directly on board. NOTE: THAT THIS POWERBOARD ASSEMBLY IS USED IN SEVERAL OF OUR DEVICES WITH MINOR REVISIONS SUCH AS S1 AND R6 BEING EXTERNALLY MOUNTED VIA INTERCONNECTING LEADS.

5. Attach and wire T1 transformer being very careful not to break the thin wires of the output winding. Use RTV to attach transformers when using perfboard. When T1 is purchased from INFORMATION UNLIMITED it will have pins for mating with the optional printed circuit board. However, the secondary output circuitry will still be the wire leads that must be secured and held in place with RTV or equivalent. Do not connect T2 high voltage pulse transformer at this time.

6. Connect up any external leads and battery clip CL1. Verify wiring accuracy and quality of solder joints. Check for shorts or danger points.

7. Connect up a 6-volt source to CL1 and measure approximately 175 volts at point W on FIG 1. Input current should be between (50) and (75) ma.

You may want to check the wave shapes on the collectors of Q1 and Q2 and point Z. This is usually not necessary if the above measurements are verified. Finger touch Q1 and Q2 and check for cool or slightly warm.

8. You now may connect in T2, These connections must be shiny and properly spaced or flash over will occur. Form a temporary gap of no more than ¼" at output leads. This prevents damaging over voltage from being produced across C4.

9. Reconnect 6-volts and immediately note a sparking across temporary gap. Quickly adjust R6 to limit and note sparking rate changing accordingly. Note values of input current at these limits. Readjust to lowest rate as this setting demands the minimum amount of power.

10. Connect up appropiate output leads

11. Carefully clean HV output connections and verify absence of leakage by observing operation in the dark. Prepare some hot paraffin wax and dip board up to only the HV components consisting of T2, D9 and C4. Repeat and build a healthy layer.

Power board is ready for action!