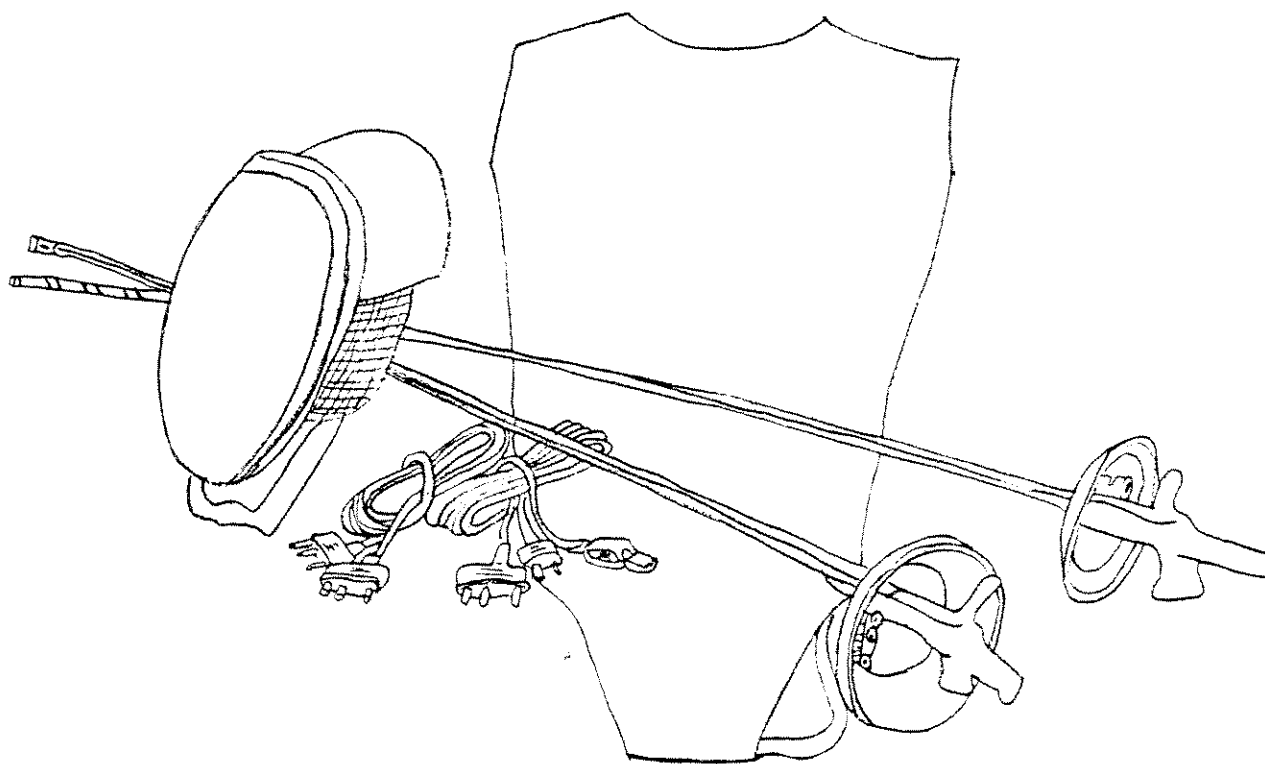


SS
1900
.L5
Bx1-#022
Donnen

c.1
cs cl

MAINTAINING PERSONAL ELECTRICAL FENCING EQUIPMENT



A Prevost Paper
by E. R. Donnen
April 30, 1981

Index

Introduction

The Electric Foil 1 - 6

The Electric Epee 7 - 17

Body Cord 18 - 19

The Lamé 20 - 21

The Blade 22 - 23

The Mask 24

Blade Glueing Jigg 25

Simple Two Bulb Test Box 26

Complete Five Bulb Test Box 27

Complete Tool Index 28

Bibliography 29

Introduction

This paper deals in detail with the maintenance procedures required to sustain personal electrical fencing equipment. It is intended as a guide to help novice fencers repair and maintain their equipment.

The techniques and advice set forth in these pages are in no means the only techniques that can be used; merely one way of many that will yield a high degree of success for the modern electrical competitor.

Equipment List For Rewiring an Electric Foil

Foil and tip

Jewelers screwdriver

Sandpaper

Vice

Glue

30 guage insulated wire

Wire Strippers

Tape

Solder

Soldering gun

Flux

Pliers

Small parts recepticle

Needle nose pliers

Glueing jig

Weapon tester

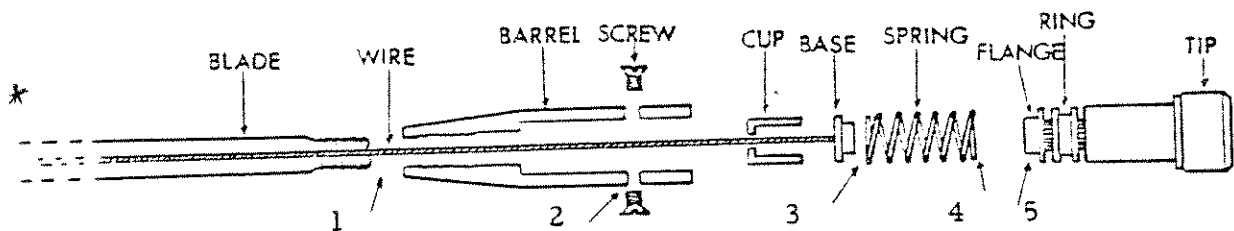
500 gram weight

Point setter

Contact Cleaner

The electric foil is nothing more than a long switch. The tip normally is making contact with the blade causing a closed circuit. If anything goes wrong the contact is broken, the circuit is open and a white light goes on indicating a circuit interruption. Because of this, almost any malfunction in the circuit will be instantly indicated.

The following areas are most likely to cause failure in the foil tip.



1. Check to make sure the barrel has not worked loose and is causing an intermitent signal. A loose barrel will also cut the wire given enough time.
2. Screw must be tight and corrosion free.
3. Spring ends tend to corrode and collect dust. Sand the spring ends
4. along with the tip flange and wire blade. Clean with contact cleaner.

Do not lubricate, stretch the spring evenly to insure a proper fit, a

curved spring may short out against the barrel.

5. Make sure the tip flange is secure to the tip and clean.

Foil Wire Replacing Procedure

The following is a step by step procedure for replacing the wire in a foil.

1. Put the blade in the vice and unscrew the barrel using the pliers. (when the barrel is twisted the wire will break off from the base)
2. Depress the tip in the barrel between thumb and forefinger and remove the ring screws using the jewelers screw driver. Release the tip slowly.
3. Put the small parts in a cup or tray for safe keeping and cleaning.

*Note: Steps 4-9 can be ignored if a wire with base is used instead

4. Remove the base from the cup. Needle nose pliers are handy for this.

5. Put the base in the vice for soldering.
6. Strip 1/8" off both ends of a 40" length of wire.
7. Heat the base with the soldering gun and remove the old wire.
8. Heat the base with the soldering gun and insert the new wire and solder it in place. Make sure you have not put the wire in from the wrong end before soldering. Too much solder will make the wire brittle. Let it cool.
9. Slide the cup up the wire from the other end of base and seat the base firmly.
10. Clean the base with contact cleaner.
11. Disassemble the handle on the blade and remove the old wire.
12. Clean the groove of all the old glue and foreign substances.
13. Slide the barrel up the wire almost all the way to the cup, but do not seat it.

14. Put the wire in the groove by the threads at the end of the blade

and screw the barrel on. *note: be sure not to scratch the

insulation off the wire; a drop of glue on the threads can save a

lot of problems later.
15. Pull the cup into the barrel gently and seat it with a push from a

point setter or a screwdriver.
16. Run glue down the length of the groove in the blade and set the

wire into the groove.
17. Put the blade into the glue jig so the blade curves with the groove

on the outside of the curve. This insures the wire will be slack

enough when released so it will not break when flexed. Let it dry

in the jig. (see Blade Glueing Jigg pg. 15)
18. When dry, clean the excess glue off with sandpaper taking care

not to scratch the insulation off the wire.

19. Clean any corrosion off the flange, spring and tip with sandpaper

and then clean with contact cleaner.

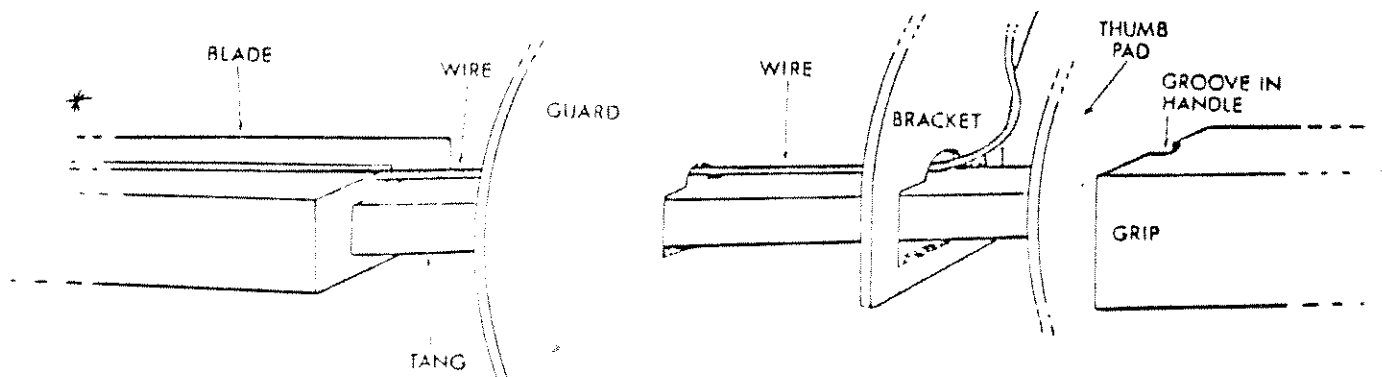
20. Align the holes in the ring with the holes in the barrel and depress

the tip and spring to put the ring screws in.

21. In order, put the guard, brackets, thumb pads and grip on the tang.

Be certain the wire passes through the groove in the guard, bracket

and handle to avoid it being crushed when the pommel is tightened. (see below)



22. Put the insulating sleeve on the wire and make sure it reaches from

the guard to the body cord socket.

23. Tape from the tip down the blade 5" in two sections, one section for

the blade and one for the barrel.

24. Hook the weapon to a weapon tester and check it with 500 gram weight.

Equipment List For Rewiring An Electric Epee

Epee and tip

Jewelers screwdriver

Sandpaper

Vice

Glue

30 guage wire (insulated)

Solder

Wire strippers

Soldering gun

Flux

Pliers

Small parts recepticle

Needle nose pliers

Gluing jigg

Weapon tester

750 gram weight

Point setter

1.5 mm shim

0.5 mm shim

Contact cleaner

The epee is a normally open switch. If there is a break anywhere in the circuit there will be no indication of malfunction until the circuit is tested. To create this circuit two wires are utilized in the blade terminating in two separate contacts in the point. There are two major types of points used today. (see fig A; 1, 2)

In the type #1 "B" is a concentric ring which is always in contact with the point barrel by way of the "large spring". The point itself has a spring loaded brass rod which will make electrical contact with contact "A" when the point is depressed. The "large spring" adjusts the amount of force needed to make electrical contact, the "small spring" adjusts the distance the point has to travel to accomplish this.

In type #2 "C" and "D" are mounted side-by-side and a "small spring" makes the contact between the two points. The "small spring" adjusts the amount of travel the point has to make by screwing the

spring in or out. To make proper contact the spring must be exactly centered over the two points. (see fig. B)

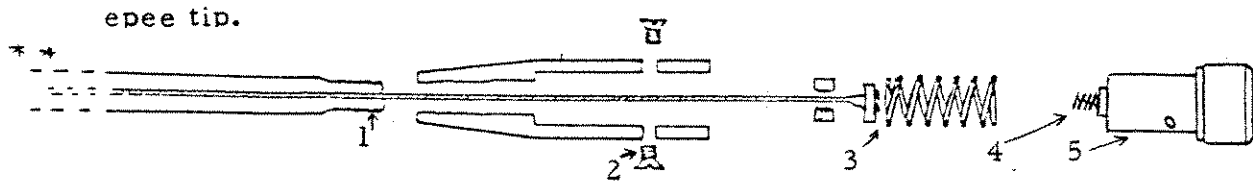
Spring adjustments

"Small spring" adjustments must be checked for travel when finished.

With a 0.5 mm shim inserted between the flange collar and the base depress the tip.(no contact should be made, see rule 732) Adjustments can be made by screwing the spring in or out. Total travel must be more than 1.5 mm.

Large Spring adjustments are made by stretching the spring. Make sure the "large spring" also remains straight. If the spring is too long, try a shorter spring first. Test the tension with a 750 mm gram weight. The spring should be strong enough to raise the weight after being depressed.

The following areas are most likely to cause failure in the

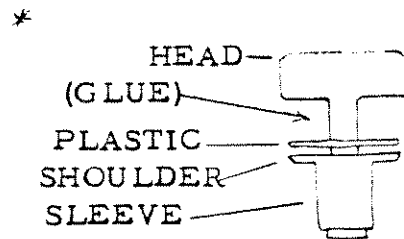


1. Check to make sure the barrel has not worked loose and is causing an intermitent signal. A loose barrel will cut the wire insulation and stretch the wire.
2. The screws must be tight to prevent the tip from leaving the barrel or jamming on an angle when depressed.
3. The electrical contacts tend to get corroded and collect dust. Sand lightly and clean with contact cleaner.
4. The end of the small spring is part of the electrical circuit and therefore must be free of corrosion. Sand and clean with contact cleaner. Make sure the spring is straight.
5. Clean the tip of corrosion so it slides smoothly into the barrel.

Do not lubricate as this tends to collect dust which will foul the electrical circuit.

6. Make sure the head of the point is secure to the body of the point.

If not, apply a small amount of glue to the shaft of the head.



Epee Wire Replacing Procedure

1. Put the blade in the vice, and unscrew the barrel using pliers.

(when the barrel is twisted the wires will break off from the base.)

2. Depress the tip in the barrel between the thumb and forefinger and

remove the sleeve screw, using a jewelers screwdriver. Release

the tip slowly.

3. Put the small parts into a cup or tray for safe keeping and cleaning.

*Note: Steps 4-9 can be ignored if wires with base are being used instead of rewiring.

4. Remove the base and insulating ring from the barrel using a small

screwdriver.

5. Put the base in the vice for soldering on the new wires.

6. Strip 1/16" off both ends of both wires.

7. Heat the contacts with a soldering gun and remove the old wire with

needle nose pliers. Be careful not to overheat the contacts , thereby

damaging the base.

8. Apply flux to the two pins of the contacts and clean the soldering gun of excess solder and dirt.
9. Heat first one pin and solder the wire on. When this pin cools heat and solder the other wire to the other pin.
10. Make sure no solder has bridged the gap between the two pins and no excess exposed wire is left beyond the pins.
11. Clean the contacts with contact cleaner.
12. Disassemble the handle on the blade and remove the old wire.
13. Clean the groove with turpentine or lacquer thinner to remove the old glue.
14. Slide the insulating ring up the wires to the base, then add the barrel to the wires.
15. Put the wire in the groove by the threads at the end of the blade and carefully screw the barrel on. (note: be sure not to scratch the in-

sulation off the wires.) A drop of glue on the threads will help

keep the barrel on solidly.

16. Pull the base gently into the barrel and seat it firmly with a point

setter.

17. Run glue down the length of the groove with your finger and set the

wire into the groove.

18. Put the blade into the jig so the blade curves with the groove on

the outside of the curve. This insures the wire will be slack

enough when released so it will not bend when flexed. Let it dry in the

jig. (see Blade Glueing Jiggs pg. 15)

19. When dry, clean the excess glue off with sandpaper taking care

not to scratch the insulation off the wires.

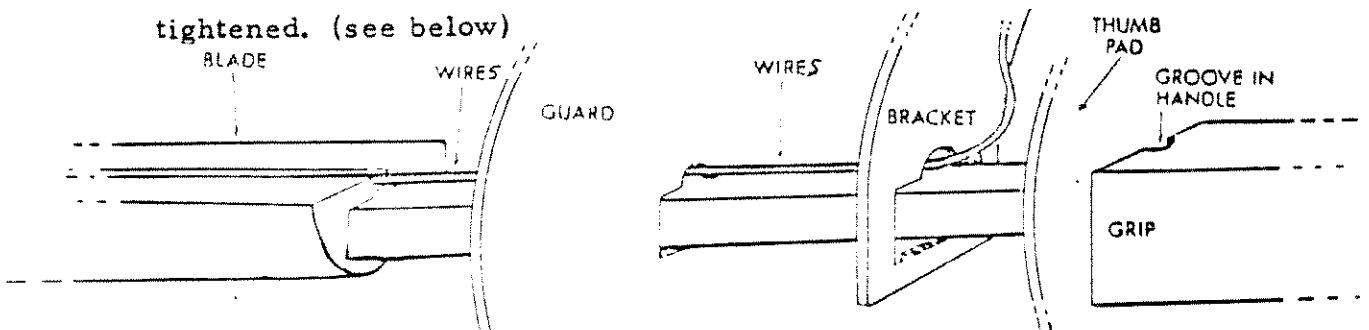
20. Clean any corrosion off the springs in the tip and clean with

contact cleaner.

21. Align the holes in the sleeve with the holes in the barrel and depress the tip and spring to put the sleeve screws in.

22. In order, put the guard, bracket, thumb pad and grip on the tang.

Be certain the wires pass through the groove in the guard, bracket, and handle to avoid them being crushed when the pommel is



23. Put the insulating sleeves on the wires and make sure they reach from the guard to the body cord socket.

24. Wire the ends of the wires to the connectors in the body cord recepticle.

25. Test the weapon with a 750 gram weight. The tip should be able to raise the weight (see 732).

26. Check the travel of the point with a 0.5 mm shim and a 1.5 mm shim.

Body Cords

Body cords are often subject to failure due to the presence of moisture and constant flexing. Listed here are some common maintenance procedures for the care of body cords.

1. After use, wipe off all moisture, especially around the contacts.

2. Store them separately from wet jackets and clothing.

3. Check with an ohm meter for less than 5 ohms resistance. If

the resistance is getting too high:

- a. clean all solder on screw connections with contact cleaner and

tighten

- b. look for broken connections near the attachments, when found

cut off all wires and start over

- c. check for cracks in the wire; this leads to corrosion, cut off

all broken insulation and start over

- d. clean the pins and leaf with contact cleaner and sand where necessary



- e. spread the leaf for tighter contact or open the pins wider on split pin plugs

4. When re-wiring ends, solder the wire strands together, even if a screw will be used. Make the soldered ends small and clean.

The Lame

The Lame is a fabric material embeded with fine metal wires on its outer surface. It has a backing of moisture resistant plastic to prevent the wires from corroding from sweat. It is this perspiration and other moisture which eventually will cause failure.

With normal care the lame may last for years of competition.

Normal care includes:

1. Hang up the lame, never ball it up or pack it in an air tight package.
2. After use, wipe the lame especially the neck and arm opening with a clean moist cloth to remove any salt deposits, then dry and air out.
3. If resistance of over 5 ohms is found all over the lame, soak it by hand in warm water, woolite, and a small amount of clorox. rinse twice in warm water and hang it to dry where it can dry quickly. In a emergency spray contact cleaner can be used.
4. Small holes can be patched with a spare piece of lame material

sewn with the patch ends folded under itself to insure good electrical connection. Save an old lame a source of spare material.

5. New pieces of lame material can be added to the neck and arm as needed to extend the life of the lame. Check the rules book for details.

The Blade

The blade should be lightly sanded to remove rust spots (causing an off target by the opponent if the spot is hit) This also removes any small metal splinters. Loose wires should be inspected and reglued in place at the time.

Make sure there is no rust when the blade meets the guard, or the brackets of the connector meets the guard. Check to make sure the grip has a groove and the wire has not been crushed against the bracket. The pommel should be tight to ensure that everthing makes good electrical contact.

The connector itself should be sanded and rust free both where the wire is attached and where the socket for the body cord enters. Contact cleaner is also helpful at this point.

Regular inspection and cleaning will insure a failure free weapon.

Checking with an ohm meter is preferable to test lights because a light will not indicate a partial resistance in the weapon which when added to other equipment (ie - body cord, reels, floor cable) may have a total resistance greater than should be allowed. Check the rules book for tolerances. A clean weapon can have "0" ohms resistance.

The Mask

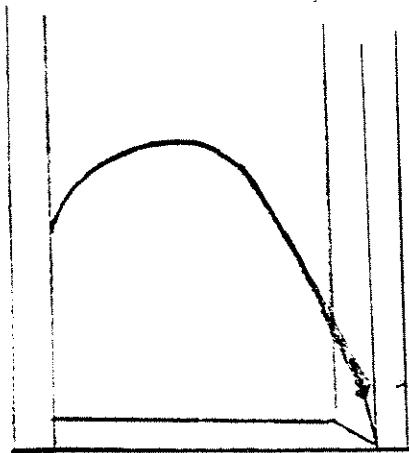
The mask is made of a mesh of wire 1 mm diameter with a maximum opening in the mesh of 2.1 mm. Slightly damaged mesh can be strengthened by re-trimming at a professional metal trimming establishment, but the cost is usually prohibitive. There are three basic checks to be made of a new or old mask to insure it is ready for competition.

1. With a spring loaded punch check the mesh for penetration. Check especially dents or irregularities in the shape of the mesh. The punch should have 4° conicity between the face and axis and be forced by 7 kilograms 27/7.
2. The bib should be insulated so as not to conduct electricity from a lame to the mesh. The mesh should also be insulated for use in foil.
3. The bib should be sewn in for added security.

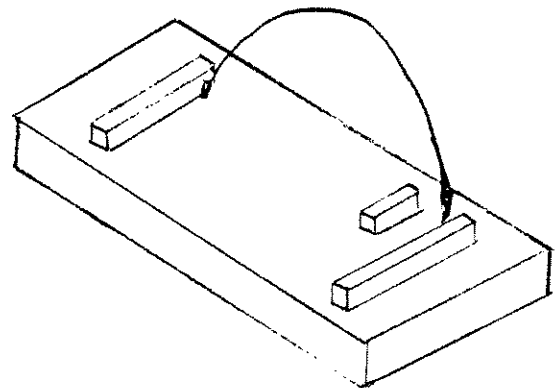
Blade Glueing Jigg

There are many types and types of blade glueing jiggs available to anyone who is willing to put several pieces of material together or just use existing structures. The following are three basic types of simple jiggs that can be found or fabricated easily. The supply of ideas in this area is endless.

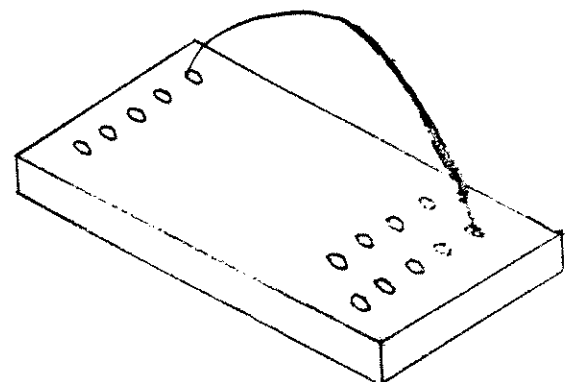
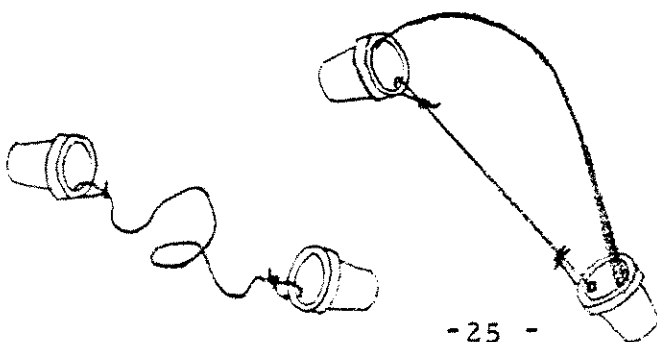
A. The Door Jamb

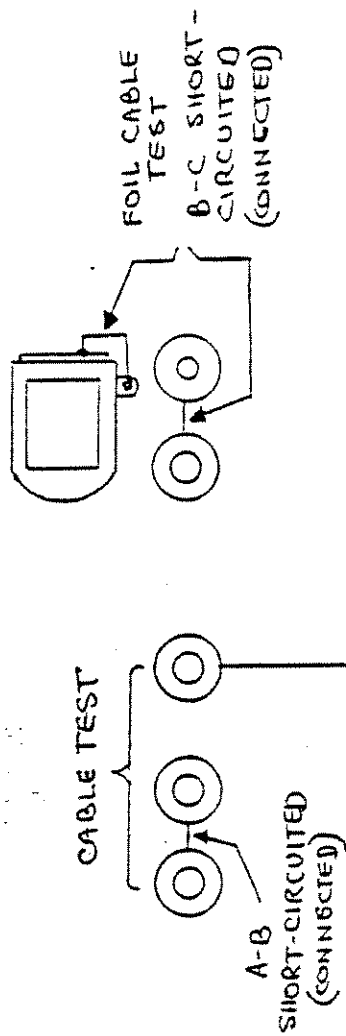
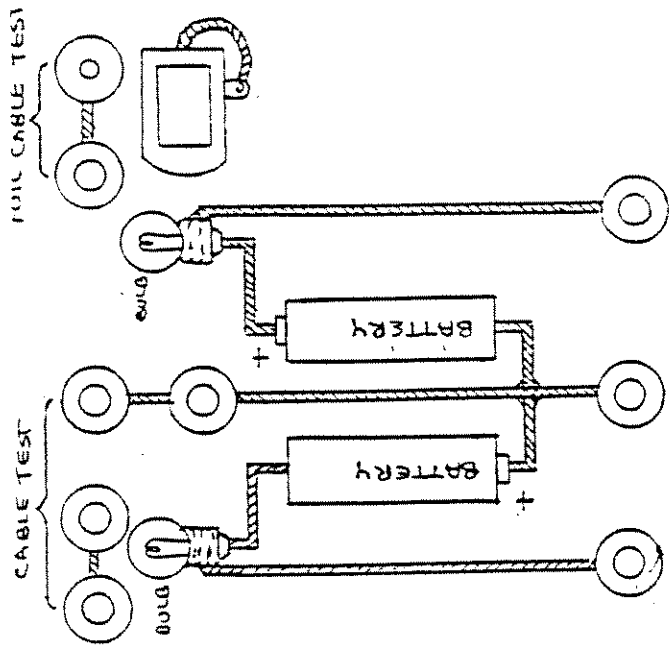


B. The Wood Board

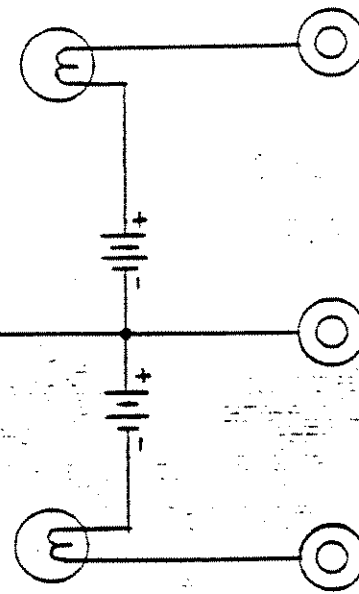


C. The Adjustable Cup and String

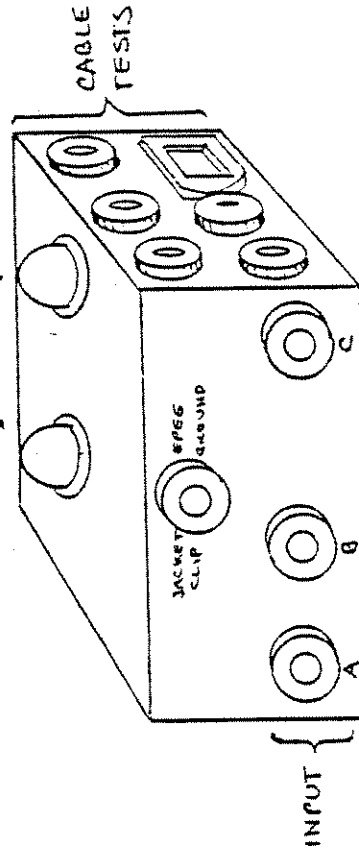




BANANA JACK FOR PLUG-IN POST
(FOR EPEE GROUND & JACKET CLIP)



BULBS



* SIMPLE 2-BULB TEST BOX FOR WEAPONS & CABLES

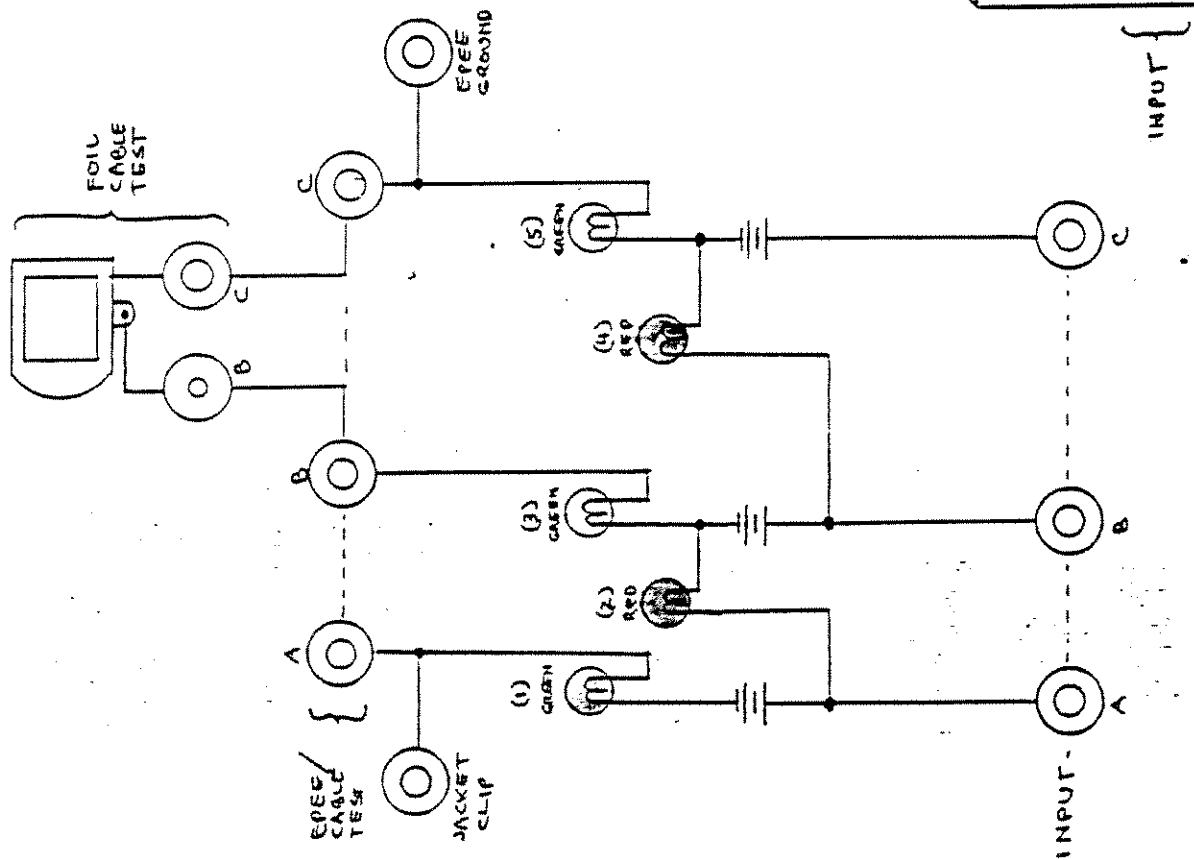
- PLUG CABLE INTO INPUT OF BOX

WEAPON TEST:

- PLUG WEAPON INTO OTHER END OF CABLE
- FOIL: RED BULB (#4) SHOULD LIGHT UP. WHEN TIP IS DEPRESSED IT SHOULD GO OUT
- EPEE: DEPRESS TR. BULB # 2 SHOULD LIGHT UP, IF BULB # 4 LIGHTS UP, A SHORT CIRCUIT IS INDICATED. TOUCH EPEE GUARD TO POST IN "EPEE GROUND" JACK. LIGHT #5 SHOULD LIGHT UP, INDICATING GOOD GROUND CIRCUIT.

CABLE TEST:

- PLUG OTHER END OF CABLE INTO TEST SOCKETS. (FOR FOIL CABLE, CLIP ATTACHMENT TO POST IN "JACKET CLIP" SOCKET.
- 3 GREEN LIGHTS INDICATE A GOOD CABLE. ANY RED LIGHT INDICATES THE PRESENCE & LOCATION OF A SHORT CIRCUIT. LACK OF ANY GREEN SHOWS A BROKEN WIRE OR OPEN CONTACT.



The Complete Tool Index

Jewelers screwdriver
3/8" blade screwdriver
1/8" or 3/16" blade screwdriver
1 pair pliers
wire cutters
exato knife (#11 blade)
small scissors
cotton swabs
3/4" tape
#16 plastic tubing
12L24 and 6 mm taps and dies
files: 3/16 rat tail, 1/4" square, * and 12" flat single cut
contact cleaner
outside hex wrenches; 6, 8, and 9 mm
#420 channel lock pliers
soldering gun
resin core solder
Glue Duco household or contact cement
hacksaw
wood or rolled leather mallet
1 ox ball peen hammer
5" jaw table vice
medium, fine emery cloth
bench grinder
tool panel with peg board hooks
blade gluing jig
ohm meter
work bench
0.5 mm shim
point setters
needlenose pliers
500 grams weight (foil)
750 weight (epee)
shims (epee)

Bibliography

1. Electrical Fencing Equipment; Rudy Volkmann; Arves Press, 1975
2. Transistor Manual: J.F. Cleary; General Electric Co., 1969
3. Energy Electricity and Electronics: W. Culpepper Jr; 1967
4. Electronic Communication: Robert L. Shrader; McGraw Hill, 1967
5. Understanding Solid State Electronics: W.E. Hafford; Texas Inst., 1972
6. Interview and on the Job Training: D. Dechaine; Cornell Open, 1981
7. Fencing Rules: J. A. Byrnes; AFLA, 1974
8. Technical Talks: J. A. Byrnes; American Fencer

Illustrations

* D. Dechaine

** From D. Dechaine