KF BOOK

RF NOTE #24

214-0025-01-01_00

3/2/78
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Modification of Existing Cyclotron to Reduce RF Leakage

Sources of leakage

A simple passive hand-held rf field monitor probe was built which made it very easy to identify two fairly large sources of rf leakage from the existing cyclotron. There is considerable rf emanating from the dc leads to the filaments of the transmitter. The other leak is from the beam probe. When this probe is pulled out the leakage is satisfactorily small, but when it is pushed in between the dees it gives a very large signal on the push-pull mode and at least ten times larger on the push-push mode.

Recommendations for modifying the probe to eliminate leakage

Since it is easier to modify the simple differential beam probe, it is proposed that one of these be modified, and if this modification proves to work well, then the combined beam probe can be modified. The modification consists of cutting the four copper water pipes one foot from the probe and inserting approximately 6 inches of polythylene hose there to interrupt the current path while leaving the water path the same.

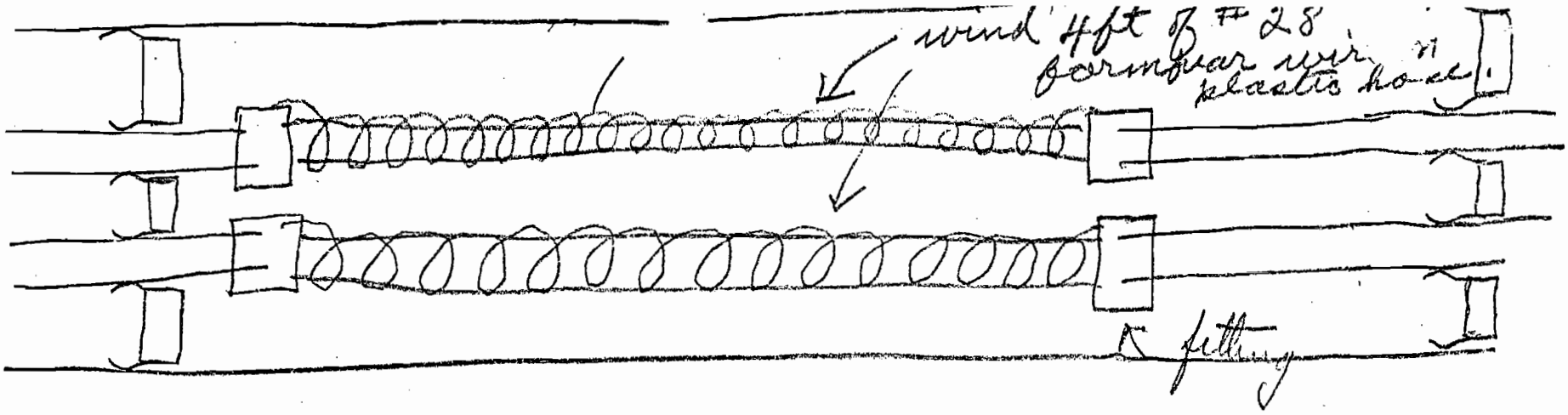
The rf is picked up by capacitive coupling to the dees and when the copper pipes have been cut, the rf voltage on the probes will be determined by the ratio of the capacity to the dee and to the housing. Let us estimate that the former is .2 pf and th latter 2 pf so that the voltage could be as high as 5KV, and if more capacitance is added to reduce this, said capacity must be rated for $V\omega c = 4 \times 10^{5} \times 10^{8} \times 2 \times 10^{-13} = 8$ amps.

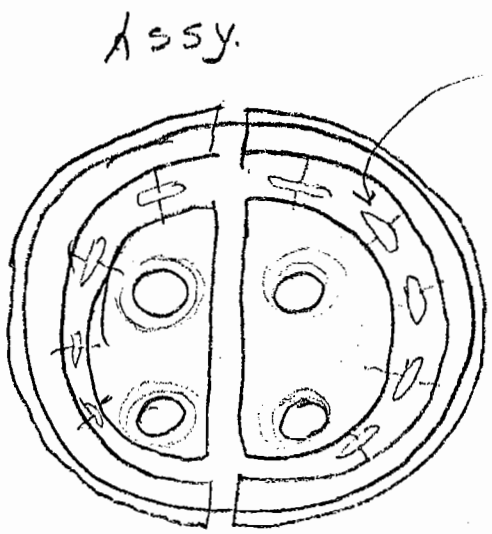
It is proposed that two boron nitride disks be machined and assemblies as shown in figure 1 be made to fit on the four copper pipes on each side of the plastic pipes. The current from the probes would flow on the inductors (about 10 μh) wound on the plastic pipes. This π filter should solve the problem.

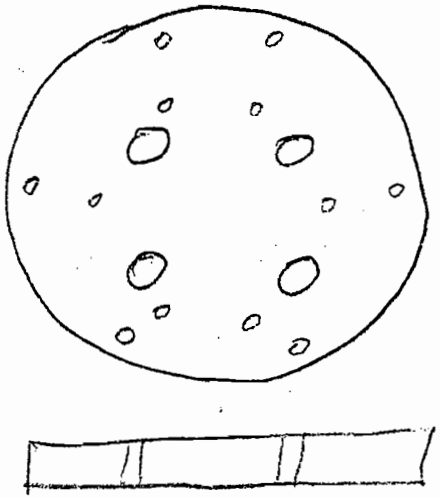
Recommendations for modifying the filament leads

First, the hot side of the filament should be bypassed to the ground side by putting a ring of some 50 condensers (.05 mfd at 25 volts) around the periphery of the socket. Then two inductors should be made from solid 5/8" Cu round bar stock, approx. 10 turns on a 4" or 5" diam. form. Then, where each of these goes through the cabinet, a special annulus, with finger stock wiping on the 5/8" diam. rods, and having some 20 or 30 of the .05 mfd capacitors mounted on each should be made. Figure 2 shows how to do all this.

It won't be until we have done these things that we can start looking for other sources of rf leakage, such as the doors.


wind 4ft of #28
bare wire
plastic hose
fitting


Assy.
capacitors
inner ring


1/4"
Boron nitride piece
quantity, 2.

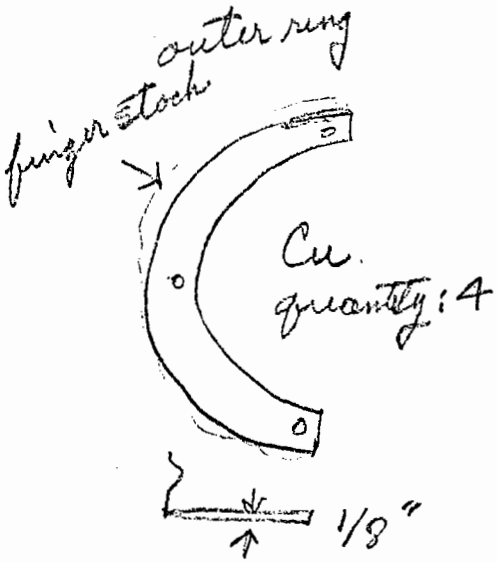

outer ring
finger stock
Cu
quantity: 4
1/8"

Fig 1

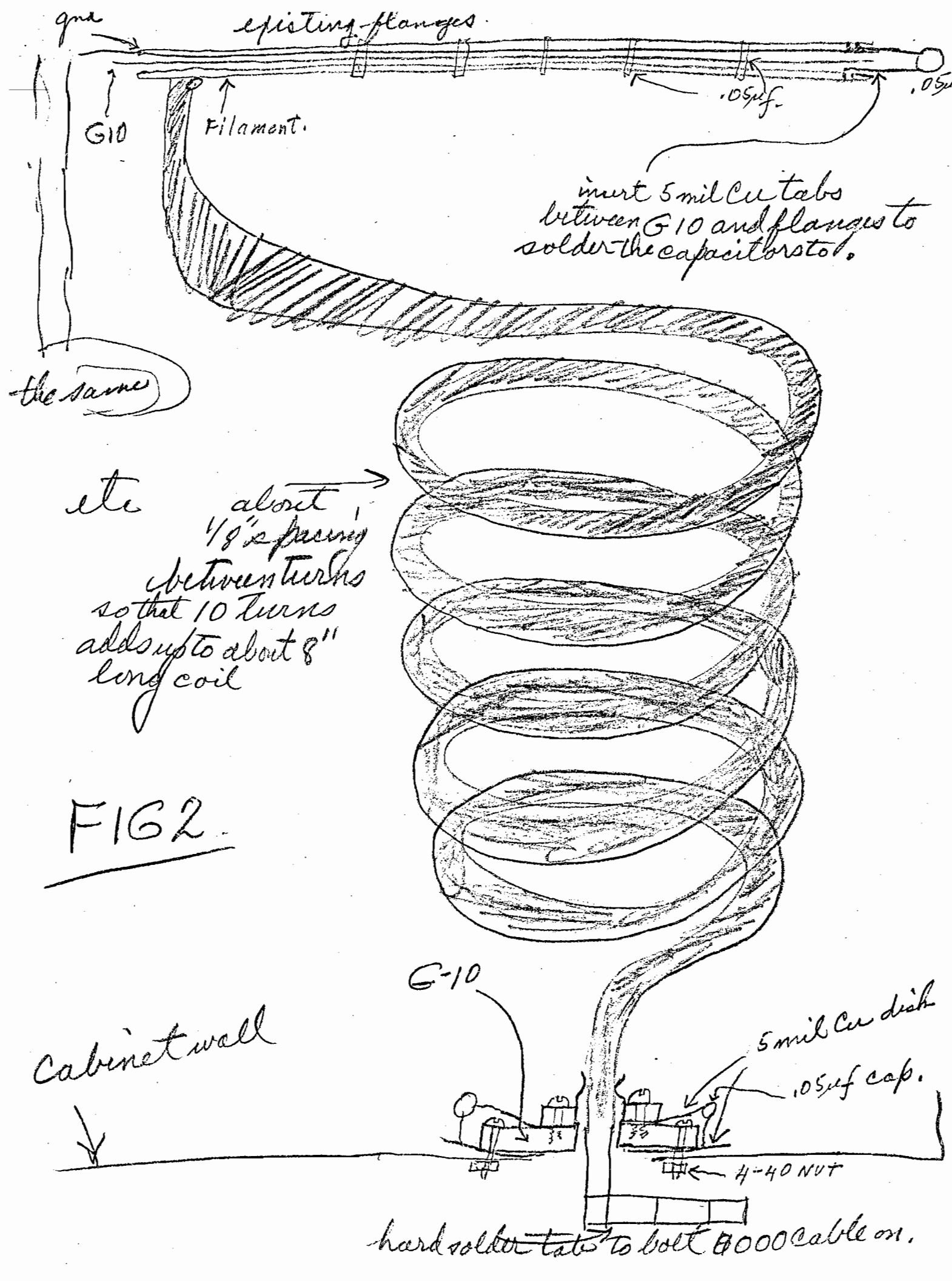

gnd
existing flanges
G10
Filament.
.05uf.
.05uf.
insert 5 mil Cu tabs between G10 and flanges to solder the capacitors to.
the same
etc
about 1/8" spacing between turns so that 10 turns adds up to about 8" long coil
G-10
Cabinet wall
5 mil Cu disk
.05uf cap.
4-40 NUT
hard solder tabs to bolt @ coax cable on.

FIG 2.