VINTAGE RADIO

By JOHN HILL

Safety with vintage radios

Vintage radio restoration is a hobby that I pursue with great enthusiasm. However, I never let my enthusiasm take complete control for I am ever mindful of the necessary safety precautions that should be observed when working with valve equipment.

This column has often mentioned the fact that lethal electrical potentials are ever present in mains-operated valve radios. The danger takes the form of either high voltage AC or DC and to tangle with either of these nasties can end in tragedy.

The electrical and electronics trades lose several workers every year due to electrocution. With this thought in mind, perhaps we should look more closely at the safety aspects of vintage radio. Electric shock can result in any number of outcomes ranging from a bit of a tickle to severe burns, or even death. It must be avoided at all cost.

Workers in the electrical trades occasionally get a "belt" and some of the careless ones get belted at more regular intervals. There are odd individuals who seem to be able to withstand quite high levels of electric shock, but others cannot. Anyone with a coronary problem is likely to be vulnerable to even low level shocks.

The digital multimeter says it all — don't underestimate the dangers when working on valve radios. In this case, the meter is measuring the AC voltage across the anodes of a rectifier valve.

The right attitude

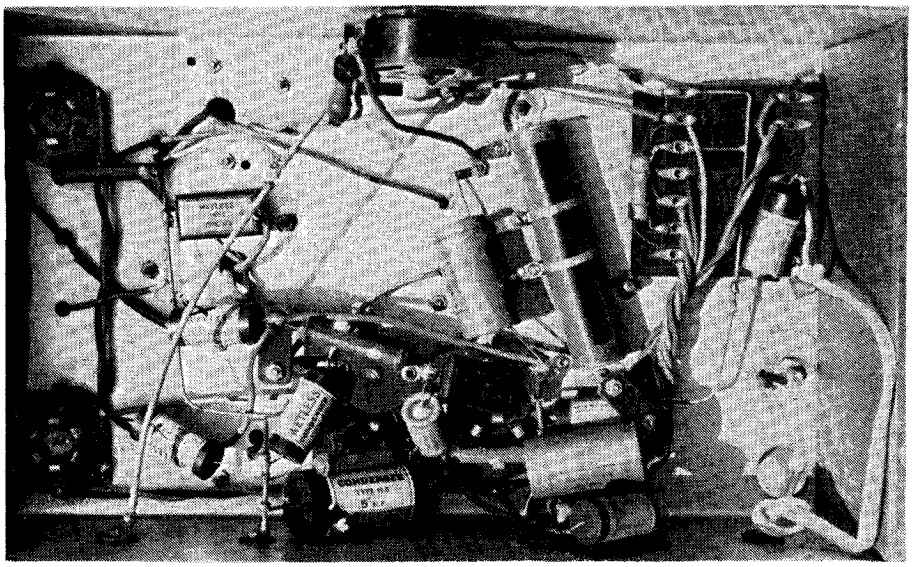
While the following may seem a little irrelevant, it does relate to safety, whether electrical or otherwise.

One of my past interests was motorcycling and for the best part of 30 years I rode numerous bikes on a regular basis. Unlike many motorcyclists, I never crashed any of my machines and in 30 years I never even broke skin, let alone a bone.

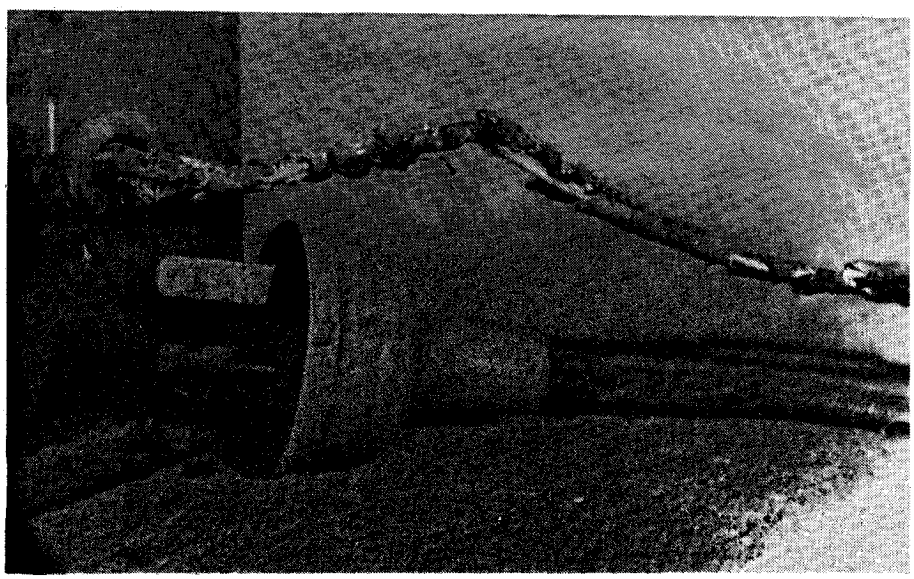
The reason for such a charmed existence is the fact that I always had a healthy respect for the dangers of motorcycling and rode defensively with the intention of remaining in the saddle at all times. That positive attitude paid off!

My approach to working on valve radios is exactly the same. It is always in the back of my mind as to what might happen if a finger is inadvertently placed where it shouldn't be. Although I have never received an electric shock, I see little point in getting belted just to find out that it isn't nice. One really good zap is all you need, so it is my intention not to have any encounters at all.

However, there is always an element of risk when working on valve equipment. In order to work on a receiver, it must be removed from its cabinet and if the set is to be tuned or tested in some way, it must be worked on while it is operating. When this is the case, the enthusiast can come in contact with lethal voltages and so must work with care at all times.



There are numerous high voltage components underneath a valve chassis so don't go poking around indiscriminately. Safe work habits need to be adopted at all times when working on valve radios, otherwise you could get a nasty shock.



Natural rubber perishes with age and a cord in this condition is in obvious need of replacement. Other power cords will show less obvious damage but should be replaced if there is any doubt about their condition.

One of the most dangerous situations is when the chassis has been up-ended but has not been positioned safely on the workbench. If the chassis slips off the bench and ends up in your lap, the outcome could be quite electrifying to say the least. Mounting an upturned chassis on the bench so that it doesn't fall is just one single aspect of developing safe work habits.

Generally speaking, the average mains operated valve radio is fairly safe to work on. In most (but not all) cases, there is nothing nasty above the chassis and all top mounted components can be touched without the danger of electric shock. The real nasties are underneath the chassis in the form of the 240V AC supply and the high tension DC.

Dangerous potentials can be found on most components: on the power transformer, speaker transformer, intermediate frequency transformers, valve sockets and on many capacitors and resistors. Even if probing around with an insulated tool, it's a good idea to keep one hand in your pocket rather than holding the chassis with it.

Now while most sets have nothing nasty on top of the chassis, there are exceptions. For example, one set in my collection has exposed connections to the rectifier socket which is mounted on top of the chassis. It also has bare terminals on the high tension choke and these are within easy reach of probing fingers.

So don't become complacent. There is always the odd set that is different and just waiting to zap the unwary. Have a good look before switching on.

Booby traps

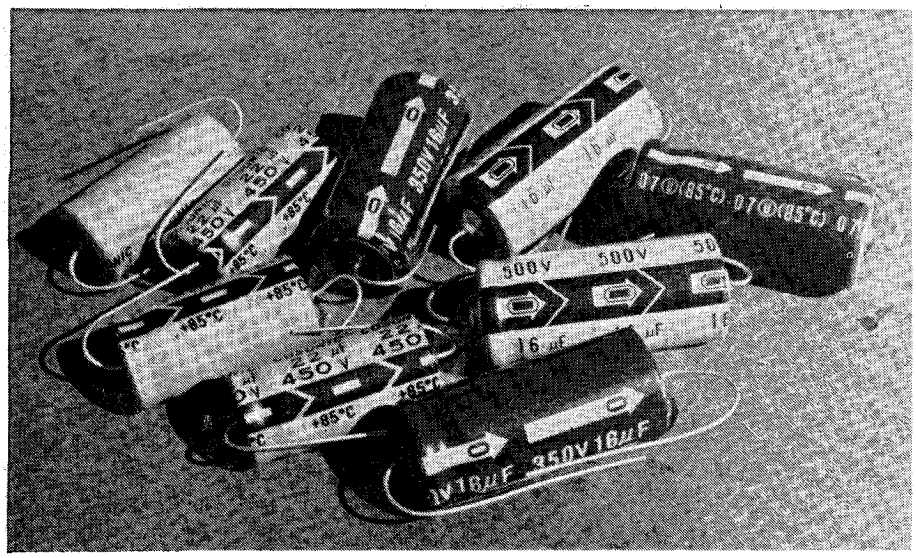
In some cases, a radio set can be booby trapped by a previous repairer. I once bought a set that seemed to be a reasonably normal mantle model with a power lead and 3-pin plug hanging out the back. The odd thing about this receiver was that it was a six volt vibrator type which made the power cord and plug seem a little strange and unnecessary.

Further investigation revealed that the power lead was connected to the voice coil of the loudspeaker. It would appear that someone had been using the speaker of the set with some other receiver and had used an old power cord to connect things up. Had that cord been plugged into a power point and switched on — blap! That would have been the end of the voice coil.

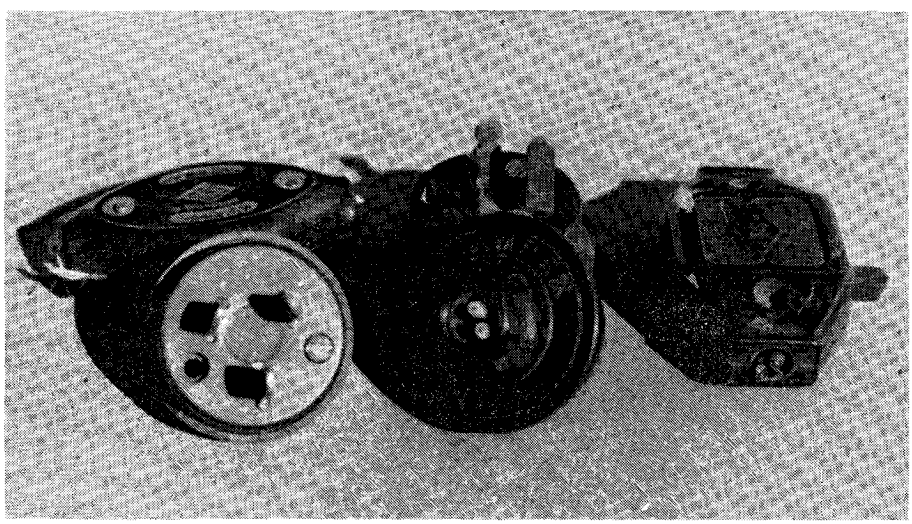
Never assume that previous repairs or modifications have been done by skilled technicians.

An old radio magazine that I read recently had an interesting question from a reader in it. He asked: "Is there any reason why the dial lamps cannot be run off the five volt filament supply for the rectifier, as the 6.3 volt supply burns them out at fairly regular intervals".

It sounds like a reasonable question except that the five volt supply is tied to the high tension DC (because it supplies the filament of the rectifier). Therefore, anyone touching the dial lamps while the set is working is likely to cop the full high tension voltage and that's not a good idea! A resistor in series with the lamps would be a safer modification.



Electrolytic capacitors are capable of storing a substantial electric charge and should be discharged as a matter of course after switching a set off. Remember that switching off at the power point doesn't always eliminate all of the nasties.



Old power plugs and switches should be thoroughly checked before being put back into service. Cracked plug tops, missing screws etc do not constitute safe electrical equipment. You should also check the wiring to make sure that a previous repairman has not set up a "booby trap".

However, if the person in question had connected the dial lamps to the five volt supply, it could have lead to a potentially lethal situation for some unsuspecting serviceman or vintage radio collector, as the case may be.

Internal faults and short circuits in valves can also put a high potential on a component that is normally safe.

While the top caps of valves are usually safe to touch, if they are shorting to a screen grid or a plate they can become quite dangerous. A short of this nature can occur if a valve base becomes very loose or something detaches itself internally inside the valve.

While on the subject of top caps, it should be remembered that not all top caps are connected to grids: some are plate connections. Most valves of this type will have insulated top cap connectors but this is not always the case. So once again, be careful and check if in doubt.

Direct coupling

Some old radios and early amplifiers employed "direct coupling", an arrangement whereby the grid of a valve was directly connected to the plate of the preceding valve. The normal practice is to couple audio valves by using a capacitor and resistor network.

Many claims were made in days long gone about the advantages of direct coupling. However, its use was not widespread which indicates that there were no real advantages. In my collection of vintage radios, only two have valves that are coupled in this manner.

The big disadvantage of direct coupling is that the grid of the second valve has quite a high positive potential and the plate voltage of this valve will need to be correspondingly higher if the valve is to work normally. In the two direct coupled sets I have, the plate of the second valve operates at 350-400 volts DC. If there was another stage following, a much higher voltage would be needed again.

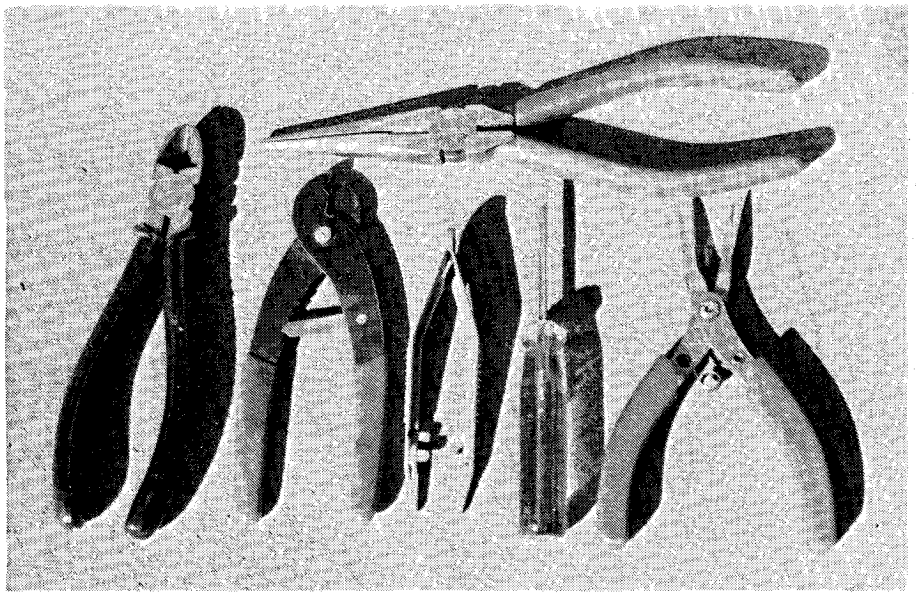
These exceedingly high voltages are backed up with electrolytic capacitors and pose a considerable threat to anyone foolish enough to offer a path of least resistance. Where someone may survive a DC jolt from a conventional receiver, the direct coupled set could well be their downfall. Some valve radios operate on incredibly high voltages.

No discussion on electrical safety (as it relates to valve equipment) would be complete without some discussion about electrolytic capacitors. These capacitors are used to smooth the high tension supply and they can hold a considerable charge for quite some period of time.

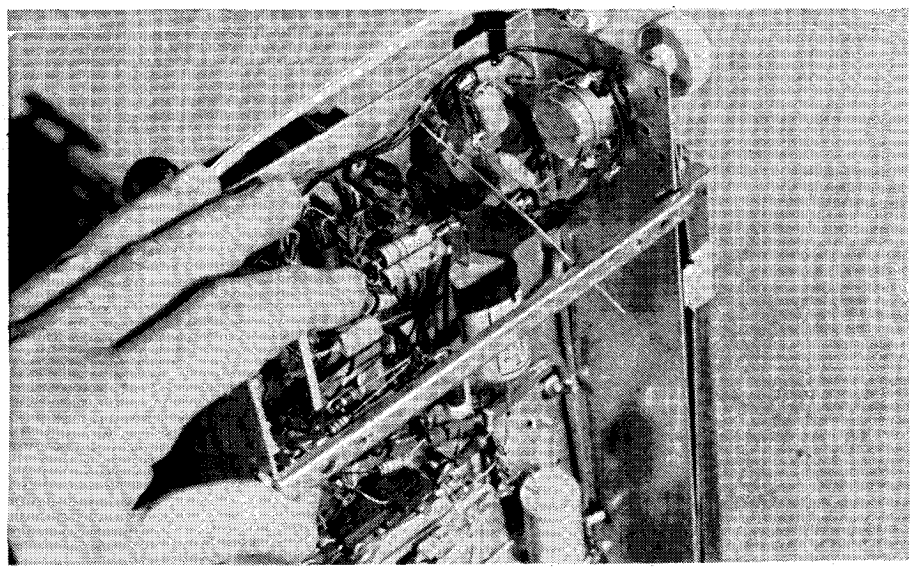
Normally, the HT electrolytics discharge themselves when the set is switched off. However, if a receiver has an open field coil or choke, then the input capacitor will remain charged. You might not think so, but there is sufficient energy in one fully charged capacitor to kill you under certain circumstances.

With this thought in mind, it is always a good idea to discharge electrolytics after switching off — even if they don't need it.

Another fairly obvious precaution is to check out power cords, plugs and switches.



Electrical hand tools require insulated handles — particularly when working on high voltage valve equipment. Replace the tool if the insulation becomes worn or perishes.



Keep that free hand in your pocket when working on an upturned chassis. Using a finger as the path of least resistance can have fatal consequences.

Cords & switches

Most receivers prior to about 1950 used power cords that were insulated with natural rubber. While this material did the job quite well, it perishes with age and can become very dangerous. If using existing cords, check them out thoroughly. The same goes for old Bakelite power plugs. If they are cracked, chipped or damaged, then replace them.

A good many old radios have single pole on/off switches and these should always be wired into the active side of the power supply. If this is not done the switch will break the neutral line and leave the set connected to active.

While I have no wish to spoil anyone's fun, the foregoing should impress upon readers the real dangers that can be encountered when dabbling with vintage radio sets. If you happen to be an old hand at the game, then nothing mentioned in this article will be new. On the other hand, if you are a new chum to the world of valves, then you could be in for quite a shock if you fail to heed good advice.