# REPAIRING VALVES

**As valve manufacture has virtually ceased, it is prudent to conserve remaining stocks. Often, valves were put aside because of a minor fault, and in salvaged receivers they will frequently be found damaged or with top caps missing. I am not advocating the installation of vacuum pumps and glass blowing equipment(!), but many valves have external faults that can be readily repaired.**

Until the 1950's, the available cements and glues coped well enough with materials with porous or soluble surfaces, but there were no heat resistant adhesives that would bond really well to metal, glass or ceramic.

Prior to the advent of metal and all glass construction, valve production was based on techniques used for making electric lamps. Connections were made to pins inserted into moulded bases, to metal caps or to terminals. It followed that cements for fastening these fittings to the bulbs were those used for lamp bases, and a typical mixture consisted of pine resin and plaster of Paris. Another formula used yellow lead oxide and glycerine!

Considering their primitive nature, these old cements were remarkably effective. But after 50 years or more, they have often deteriorated, and vigorous extraction of a valve from a tight socket is likely to result in a loose or disconnected base. Similarly, grid and plate caps readily become unstuck with heavy handling.

It's for this reason that one should always grasp a valve by the base or prise it up with a screwdriver. For easing off grid or plate clips, I find the point of an old school compass useful.

## Modern adhesives

With a high proportion of valves in need of recementing, it is fortunate that it is now possible to glue just about anything to anything. A loose base with intact wiring can be resecured by inserting some glue where it contacts the envelope, and applying mild pressure with a rubber band during setting.

The cyanoacrylic or instant 'Power Glues' are popular, but are not always ideal. This class relies on intimate contact between the mating surfaces, not always provided by crumbling base cement, and there is some doubt about their long term reliability.

A very suitable adhesive is an epoxy resin, of the type that comes in two packs. Moderately heat resistant and a good insulator, it bonds well to metal, valve bases and glass. Most importantly, it is gap filling and stable. I have valves repaired 10 years ago with epoxy, which still show no sign of coming apart.

The resin is rather viscous, and some is bound to adhere to areas where it is not wanted. Smears can be removed with a solvent, or can be scraped off with a craft knife a few hours after curing has commenced.

## Metallised valves

Loose bases on valves with sprayed metal shielding are likely to cause insta-

***Fig.1A: A common problem with metallising. Not only has the base become loose, but the earthing wire has lost reliable contact with the shielding.***

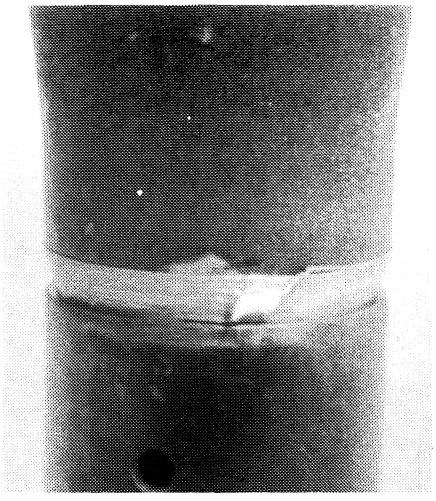

***Fig.1B: Wrap a layer of 5A fusewire around the damaged shielding and solder to the earthing wire.***

***Fig.1C: After re-gluing the base and coating the wire with epoxy resin, cover the repair with a strip of tape or paper.***

bility. A common method of earthing the shielding was by means of a fine wire embedded in the coating around the top of the base, and as can be seen in Fig.1A, any loosening of the base is likely to destroy the connection.

Figs.1B and 1C show one successful method of repair. Carefully lift out the earthing wire, scrape off the paint and then wind a layer of fuse wire on the metallising adjacent to the base, soldering the ends and the earthing wire together. Although these valves were often coated with lacquer over the metallising, contact to the fuse wire is normally adequate. If you have any doubts, first carefully clean the area to be covered with very fine sandpaper, being careful not to damage the coating further. After soldering, coat the wire and the base-envelope junction with epoxy resin.

The repair will not be very nice looking, but Philips in particular often stuck a narrow paper label around this area of their valves. A strip of tape or heavy paper to disguise the repair will not therefore look too much out of place.

## Loose caps

Missing, or loose grid and plate caps and terminals are easily fixed. Melt the solder in the cap, and straighten the lead. Lift off the cap, and after removing any remaining solder and old cement, coat the inside with resin and thread it back into position. Resolder when the resin has cured.

Sometimes the wire will have broken off short. Before cementing the cap back on, extend the lead by soldering on a short piece of 5 amp fuse wire.

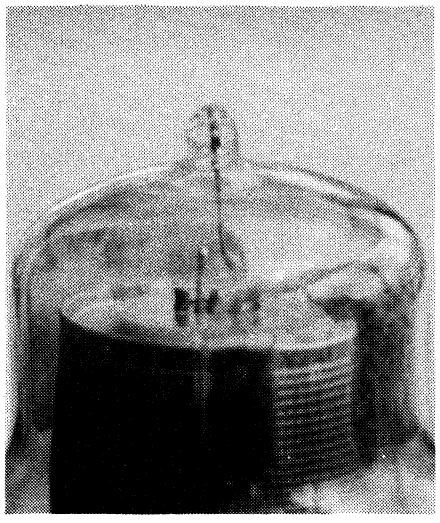

***Fig.2A: This type 24A valve has the grid lead broken off flush with the glass sealing tip.***

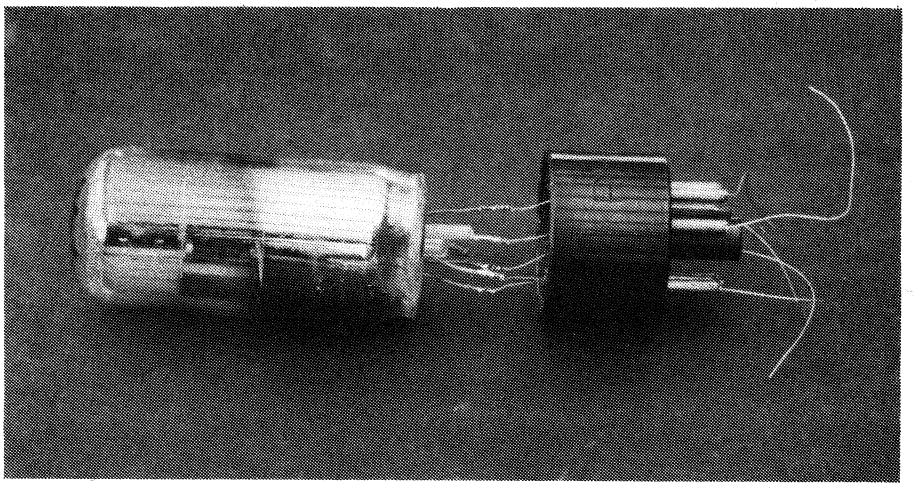

***Fig.3: This 6X5GT/EZ35 has had the leads extended and inserted into the base pins ready for re-gluing. A 5-pin base would have converted it into a type 84, or with a side-contact type P base it would have become a replacement for a type EZ2.***

More serious is the situation when the wire breaks off flush with the glass. At first sight this may seem to be a hopeless situation, but there is a remedy that works in most cases. Valve glass is relatively soft, and with a bit of care, can be cut with a fine file. Seals around leadout wires are usually generous, and can be cut back sufficiently to expose sufficient lead to salvage the valve.

The technique is shown in the photographs of Figs.2A and 2B. Use a *sharp* 4″ or 5″ fine-toothed triangular file and gently cut around the seal so as to expose about 0.3mm of wire. Loop a piece of 5 amp fusewire around the tip, and carefully solder the junction. Twist the tails of the fuse wire together and refit the cap as previously described.

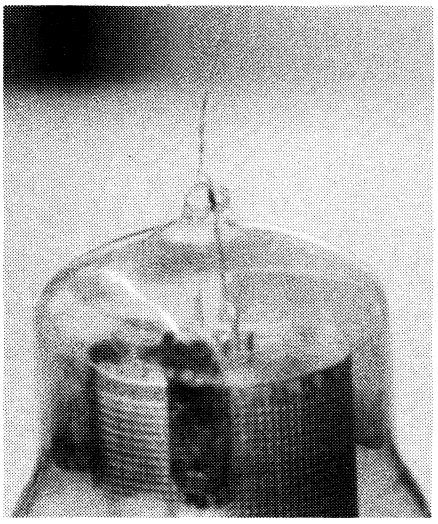

***Fig.2B: After the glass around the seal is carefully cut back with a sharp file, a loop of fusewire and a spot of solder make the valve ready for refitting the grid cap.***

## Replacing bases

Broken spigots, a problem peculiar to octal bases can be refastened with a little epoxy resin. However, if the spigot is lost, a base damaged, or any of the leads are broken, more drastic repairs will be necessary.

After melting the solder at the tips of the pins, remove the base. Then, in a good light, identify the leads and study where they emerge from the press. (The press, inherited from lamp manufacture, is the flattened glass tube that supports the electrodes and acts as the exit area for the leads). Comparison with the base connection diagram will show a sequence that enables the leads to go direct to their pins, usually without touching.

Straighten the leads and position them in the pattern that they should occupy. Sometimes one or two of the leads will have insulated sleeving fitted, if there is any risk of a short circuit. Renew the sleeving if it has perished.

Clean out any old cement and attempt a trial fitting of the base. Chances are that some of the leads will be too short, and will have to be extended with a piece of the ubiquitous fine fuse wire, but be careful to keep the diameter of the splices small enough to enter their pins.

When satisfied with the fitting, coat the inside of the base with epoxy cement and hold it in contact with the bulb with a rubber band. Carefully resolder the wires to their pins and trim off the surplus.

All this may sound a bit drastic, but it is relatively straightforward. Nevertheless, it is a good idea to practice first on

a discarded valve. Try triodes or rectifiers before tackling complex types such as octodes. This technique can also be used to 'manufacture' hard to get valves, a better solution than the alternative of changing receiver sockets.

Octal based valves are still relatively plentiful, and many were simply earlier types with new names. For example, a 6U7G can be modified to become a 6D6 by changing the base and grid cap.

## Intermittent faults

It was only the tip of valve pins which received any solder, and dry joints in the pin connections can be the source of some very frustrating intermittent faults. Any electrode can be affected, but heater leads in particular can be troublesome.

This is easily recognised when the signal fades away or recovers over a period of several seconds. Often sideways pressure on the valves will reveal the offender.

Resoldering may not be easy. Leadout wires are generally a copper coated alloy with an expansion coefficient the same as glass. Oxidation makes resoldering very difficult and cleaning can be very frustrating. Although it may sound heretical, the judicious application of a paste flux can be very helpful.

Split pins on European style bases can sometimes be spread sufficiently to access the wire. Probing with a needle may work, but if all attempts fail, the only practical remedy is to remove the base and proceed as with base replacement.

A particularly annoying and puzzling fault sometimes encountered in valves with top grid caps produces symptoms similar to a faulty capacitor, but can be easily cured once it is found. There are sudden jumps in level, often triggered by noise impulses.

Once a valve has been identified by substitution as having this problem, melt out the solder in the grid cap. Frequently the lead wire will be quite black, without a vestige of tinning. Scrape it clean and resolder.

Although some repair attempts may be unsuccessful, a surprising number will succeed and it is worthwhile making every effort — because there aren't going to be any more valves made.

Finally, when discarding valves that really are beyond fixing, it is a good idea to save a selection of bases and top caps for future repairs.