

Knobs! - Phil Mijo, Craig Marston and Gerry O'Hara

One of the most distinctive ‘accessories’ fitted to a receiver are its knobs. These ostensibly simple and functional adornments to a receiver’s front panel are little thought about when all are present and correct, but can be a real headache if not to the dedicated restorer. Yes, any knob is maybe better than no knob (well, at least a knob that ‘goes’ with the look of the cabinet and sort-of matches the others) – at least it allows the control to be operated and, if placed correctly in the symmetry of the front panel, eg. the odd one in the centre of three, or two odd ones on the outside ends of a row etc). Still, that is a compromise that few of us like to live with – at least for very long! And then there are the cases of no knobs, or pushbuttons or, worse still, missing multi-section knobs for concentric controls...

Knobs (and pushbuttons) come in a variety of materials, colours and a very wide (infinite?) variety of shapes and sizes. Many of the first knobs on radios were made from wood and later Bakelite. Metal was not used frequently due to it being a conductor. Later, thermoplastic materials were used, eg. Tenite¹.

Many manufacturers had a range of distinctive knobs – either by shape and/or with their insignia embossed on them, eg. Zenith (photo, right). If a set has at least one original knob remaining (and you are sure it is original), then you can start the hunt for matching ones. This is made easier these days by the advent of Ebay, dealers and some specialist reproductions available on the internet. Other sources are from scrap sets, museum stock, fellow collectors and pleading for the help of vintage radio forums. Yes, there are some really desperate knob-seekers out there!



If all else fails, then probably the last resort is to make them yourself. The practicality of doing this successfully of course depends on several factors, including the material the knob is to be made from, the complexity of the original design, your skill at machining (or casting/ hand

¹ Tenite is a cellulosic thermoplastic first created in 1929 for use in the manufacture of consumer goods. It is manufactured by Eastman Chemical, using softwood as a raw material. It has been used in consumer product applications from radios and telephones, to toothbrushes and toys. It can distort and even disintegrate with age, heat and damp storage conditions.

carving/filing), your patience and equipment at hand. For example, reproducing a simple turned wooden knob is probably within the realm of possibility for most folks if they have access to a small lathe, however, the same knob with fancy scrollwork or similar on the front face may not be practical by this method (photo, right). Aside from rodent attack and rotting wood, what can happen is that the knobs get banged against something and the 'repwood'² portion falls out or is smashed.



Knobs of this type may have been made by first turning the knob from solid wood and then inserting/adding the intricate centre portion that is made of repwood. FADA used repwood quite frequently and the parts really do look like wood, it is hard to detect that they aren't solid wood. Carving a pattern like that would be extremely labour intensive and some manufacturers were very good at using repwood to simulate that intricate carving. They likely had a wood carver spend hours to make the original, then all the others were moulded from that pattern. Some manufacturers also made very fancy cabinets with repwood mouldings and insignias/badges, eg. on the Radiola 21 (photo, left).

Making a Replacement 'Fancy' Wooden Knob(s)

To repair such a knob, using an original knob as a pattern, turn several knobs to work with (on a woodwork or metalwork lathe). Then fabricate a steel blade with the same outer contour as the original knob to make a specially shaped knife tool. The centre of each knob can then be recessed to accept the repwood piece, drilling the recessed area out with a forestner bit. The sample knob is then lubricated so it doesn't stick. A mould then needs to be made and a suitable material selected for the reproduction part.

Mould-Making for 'Repwood' Parts

To make a 'push mould' for a repwood part, push the original knob into the mould-making material, which could be Plasticene or perhaps epoxy wood putty (the kind you can buy in stick

² Mixture of wood dust and a binder, such as animal hoof glue

form that you kneed together and then it hardens). You could use epoxy glue, or even the 'fake wood' material (they sell this in 'Rona') which comprises two cans stuck together that you mix-together ('PC Woody'). There are also specific mould-making materials on the market but they get a bit expensive for one-off



jobs. Latex rubber might also work for a mould. You need to be careful that whatever you use doesn't get all stuck into/onto your sample knob. Even silicone rubber may work as a mould making material, but it takes a long time to harden if it is a large piece. Sometimes a softer rubber is needed to take the details of the mould and for it to be possible to separate the sample from the mould/get the finished piece out. Silicone or latex rubber can be painted on for an outer skin that is placed into 'plaster of Paris'. Using this idea, a mould can be created that is mostly plaster of Paris but the actual part that takes the form is something softer like latex rubber. Materials traditionally used by dentists and dental labs, such as the pink stuff they put in the little tray and push into your mouth can be used (ask a dentist or dental technician if you know one). Sometimes it is necessary to pour the mould in more than one layer to get the piece out. With the materials above and a bit of thinking and experimenting there is a lot that can be done.

Moulding Materials

A medium that might work well to replicate the centre repwood portion is 'Femo' and 'Premo', which can be found in an appropriate dark brown colour at Michaels (the art/craft supply store). Both are a Plasticene-like material that can be shaped and then hardened by cooking it in an oven at a low temperature.

Whatever materials and process you decide upon the objective is to replicate the repwood buttons/inserts etc. using the original good one as a pattern. Once that is done, the moulded part is glued into the recessed area of the knob.



Some material may be lost on the outer knobs but if so it can be built back with wood putty. The

epoxy type might work well for this , such as the two part wood putty (stick) that you kneed-together – this material becomes Plasticine like and then it sets-up hard - this is more durable than regular wood putty but tends to set-up very quickly (5 minutes or so).

You might make a mould of the original/good knob, add some material to fill the voids on the damaged knob, and then place that into the mould made from the good knob, to force the putty into only the areas where material is missing. Otherwise it may be possible to just fill the voids and then carefully sand to the contours.

Moulds for more complicated knobs can be made so that they come apart in layers for more to allow the moulded part to be removed without damaging the mould.

If using wood putty, this can be tinted it to obtain the desired colour by adding a colourant, eg. the powdered pigments available at Mohawk finishing supplies. Most wood repairs that are obvious are so because the colour of the putty doesn't match. Careful planning is therefore needed, together with some experimentation because putty may not accept the finish and stain etc. in the same way as the surrounding real wood does. Another possibility is to use wood touch-up pens just before lacquering to hide sins in wood filler mismatch. Often a mix of more than one colour of filler is needed, blending them together to simulate the grain. Wood is never the same tone all the way through and if the filler is monotone it will show. Wood also usually has some knots and imperfections so by blending different colours of putty, you can make really invisible repairs quite easily, if you get the colours right.

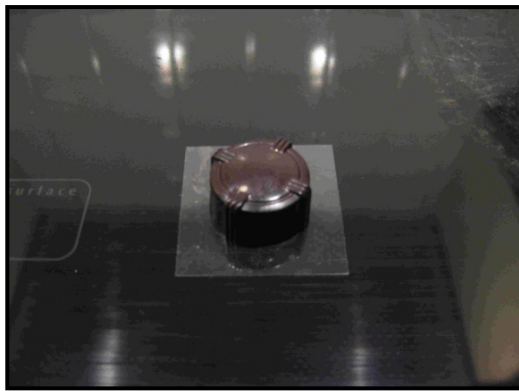


Try surrounding the damaged area with masking tape, then applying filler, smoothing it level with the masking tape and pull the tape off. This leaves the filler a few thousandths of an inch higher than the surrounding area to facilitate sanding to the desired contours. The smaller the area covered by the putty repair, the less it will show, so surrounding the problem with masking tape limits the size of the repair - you don't want it larger than it needs to be.

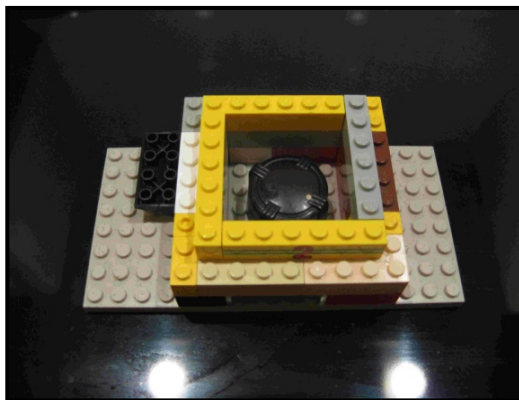


It is also possible to make a mould of the good knob and make a new one from epoxy, coloured dark brown or otherwise to suite the radio in question. This method was used recently at the SPARC museum to replicate a full set of knobs and pushbuttons for General Electric Model 66 (photos on previous page, left and at the end of this section). This console set arrived for a full cabinet and chassis restoration, but was minus all its pushbuttons and knobs. The knobs are concentric types (wavechange/tuning and

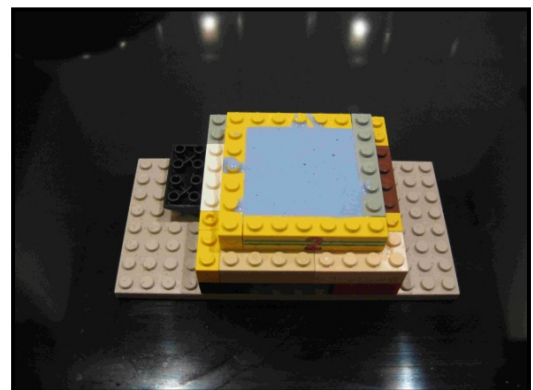
volume/on-off/tone) – so quite a complex set to fabricate from scratch. Fortunately, the SPARC museum display had an identical set on display and these were to fabricate a series of moulds using the method and materials described below.

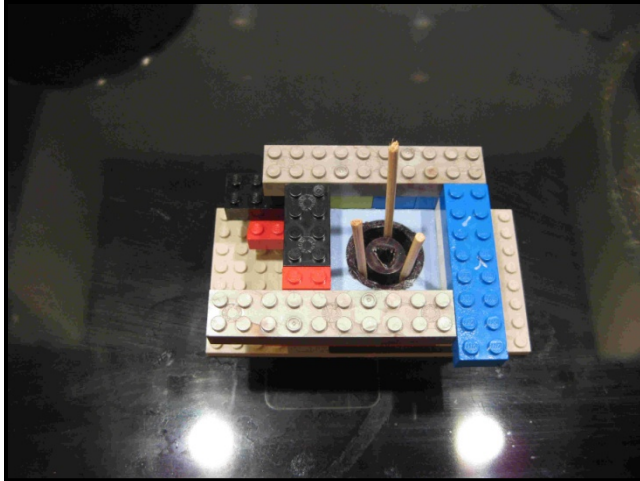


Replicating a knob by this method involves a two-part process. First, the base of the original ('prototype') knob is glued to a small sheet of plastic using 'Shoe-Gloo' (or similar) – a glue that holds well but can be pried off after drying is needed. Next, build an enclosure ('jig') around the knob using Lego blocks, wood scraps or similar (photos, left). As the mould-making material is expensive, try to build the smallest possible enclosure thereby reducing waste. An advantage of using Lego for the jig is that the moulding material will not stick to it. Use 'Smooth-On OOMOO-30' urethane material (or similar product) for the moulding material because it is easy to mix,



its density doesn't require a vacuum chamber and it doesn't shrink over time.



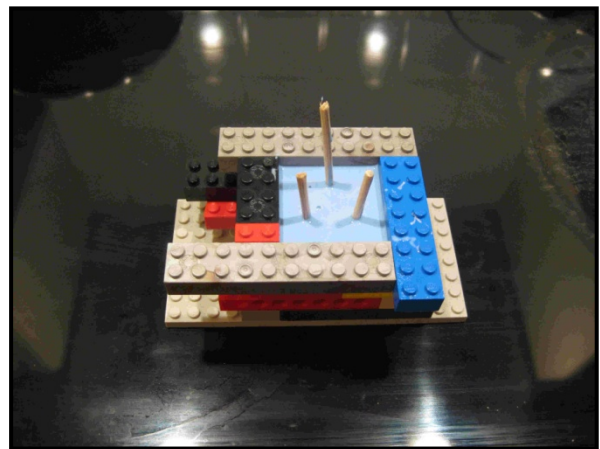


knob. The jig is then rebuilt and moulding compound poured in (photo, right). The second mould will create the knob stem and the Vaseline ensures the two halves do not stick together. Once everything is dry, dismantle the jig, remove the original knob and check for trapped bubbles. If the cavity looks fine then the two halves of the mould are put together and set aside.

For the casting material, try using 'Amazing Casting Resin' – this material is readily available, easy to mix, inexpensive and won't stick to Lego. The only downside is the material sets in 5 minutes and it only comes in white. The casting material is poured into the mould until the solution overflows through the vents. After 30 minutes or so, pull apart the mould and release the replicated knob. The drain hole castings are then cut off, the moulded part trimmed with a knife and/or filing, and any cut-outs that were not cast into the part made with a small mill on a Dremel tool or similar. The moulded parts can then be sprayed with auto paint to suite the set being restored/match the original (photo, top of next page).



Then pour the moulding compound into the jig and place it on top of an operating dryer or washer - the vibration causes trapped air to rise to the surface (photo at bottom of previous page). After the moulding material has cured (around 6 hours), the jig is dismantled and the plastic sheet is removed from the base of the knob. Thick wires or drinking straws are then glued on either side of the stem to allow the casting material to vent (photo, left). A thin layer of Vaseline grease is then applied to the base of the



In the case of wooden knobs where

'repwood' techniques are being used to mould the knob (or pattern on the knob), if the mould is good enough it can even pick up the wood grain and look very realistic especially if some paint is rubbed into the grain to give it that tonal variation.

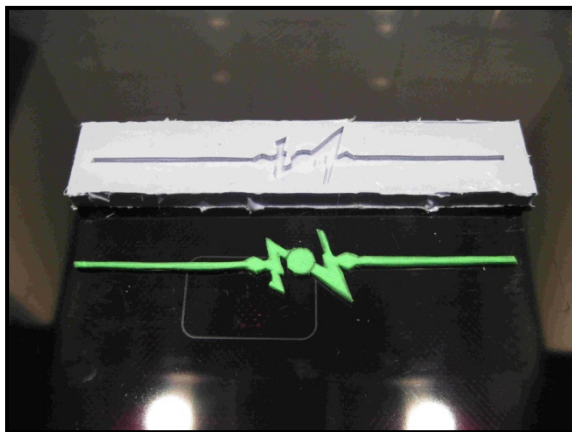
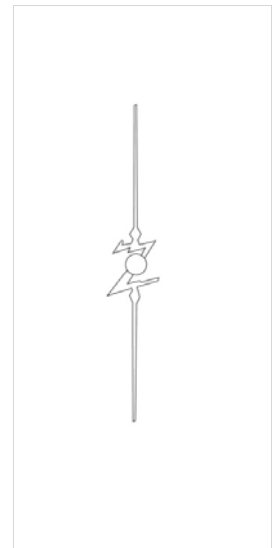
There are many other possibilities of materials that could be used for reproduction parts, eg. a mix of powdered Bakelite and epoxy, JB-Weld, and even coffee grounds mixed with Bakelite and glue have been suggested – check-out the various vintage radio forums for more ideas.



Replicating Objects from a Photo



If you are lacking an original object and it is large, flat and with well-defined edges (like a dial pointer) it is possible to recreate it using a photograph. Use a picture of the original or download an image from the internet and use a software program like MS Paint or Photoshop to trace the outline of the image. The trace can be adjusted for correct size then printed on paper and cut out (example, right).



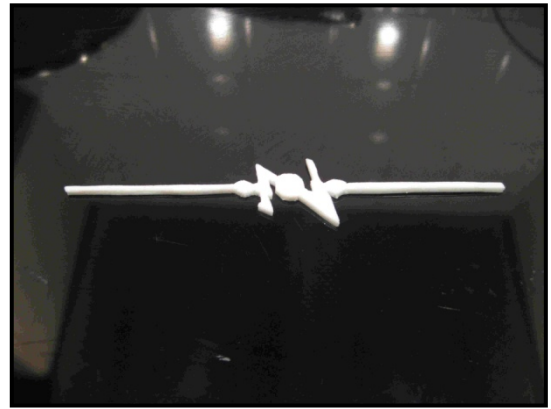
The design is then transferred to a sheet of 'hobby foam' the same thickness as the original pointer. A one-part mould-making process similar to the method above is used to create a rough copy (photo, left). The finished product is strong enough to be sanded smooth and painted (photo, at top of next page).

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If handled carefully, the moulds can be used to replicate dozens of knobs and pointers.

'OOMOO-30' is available at Fibretek in Vancouver and 'Amazing Casting Resin' is available at any Opus Art Supply store. Hobby foam can be found at most dollar stores



Other Moulded Items

A little off-topic, but it is possible to repair small broken gears with a few broken teeth by making a mould of most of the good teeth then turning the gear and placing it back into the mould along with a glue, epoxy or JB-Weld or something similar. In this way it is possible to replace only the missing teeth by using a mould as a form to make more teeth. This same technique can be applied to replace the bad portions of damaged knobs, escutcheons or other parts.

Services

There are many services offered on the internet these days for reproduction radio parts, including radio knobs, and bespoke moulding services, eg:

<http://www.antiqueradioknobs.com/services.html>

<http://www.mouldman.com/used/moulds/5721.html>

References

For further information on moulding techniques see:

<http://forums.grz.com/archive/index.php/t-174788.html>

<http://antiqueradios.com/forums/viewtopic.php?t=84061>

<http://www.vintage-radio.net/forum/showthread.php?t=49610> – posting on the UK Vintage Radio Forum and reproduced here for convenience:

Copying a control knob by moulding

In response to a request by a forum member, here is a brief outline of methods used to mould and cast copies of control knobs.

There are numerous moulding techniques, each with plus and minus points. Forget plaster moulds - they are too rigid to allow easy removal of any but the most flared knob. Also they are porous and when used with casting resin they must be sealed thoroughly or

the resin will penetrate and you will lose shape and definition. Any plaster mould is fragile and logically will not withstand more than one use.

*What's left? **Alginate** - the dental moulding compound - is both easy and quick to use. It does not require heating and is easily pourable, setting rapidly. It is also inexpensive in small quantities. It is delicate and will not last more than a few days before drying out and distorting. It will take poured resin and I've used it several times with success.*

***Gelflex** and **Vinamold** require very careful heating until liquid. This is safest when done in a double-walled pot like the old scotch glue pots, but for a one-off a normal pan can be used. Overheated, the stuff self-destructs. This should never be heated in the home as the smell is unpleasant and long-lasting. With care it can be re-melted and re-used many times over. It does suffer from trapped air bubbles so it should not be vigorously stirred during melting and once fully liquid it should be allowed to stand for a while, cooling very slowly perhaps, to help any air escape before pouring. Professionally, a vacuum pump is used to extract the air but at home the best you can do is to pour slowly over the control knob allowing the liquid to rise smoothly up the sides of the knob until finally covering to at least a half-inch, preferably more, for casting stability. Expect to find the odd air bubble which must be cut or filed from the surface of your subsequent casting.*

***RTV silicone** is a cold curing material which cannot be re-used and is expensive but has the merit of simplicity in use.*

***Latex rubber** is the favoured mould making material of those who copy chess pieces and complex figurines as the stuff is capable of recording very fine detail. In use, the item is suspended and repeatedly dipped in the liquid latex, in between times being allowed to air cure. Alternatively it can be applied by brush, again allowing curing between coats. It is a very slow process in my experience and the finished mould must be supported before castings are taken. I use a large mass of child's 'Plasticene' but putty would be as good. The moulds are delicate and there is a limit to the number of copies that can be taken before deterioration.*

Not every knob is suitable for single-stage moulding. Those with a complex shape may need a two-part mould. Polish the knob with 'Brasso' then wax polish. Leave the grub screw in place, slightly below the surface, or you will have problems

Assuming the knob you are copying is a relatively simple one with the widest part at the very back, secure this with double-sided tape into a small plastic container (for moulding with Alginate) or a metal or wood container (for hot-melt moulding). The alternative is to construct a simple timber box with a strut across the open top to carry a control. Secure the knob to be moulded to the control shaft which can then be lowered into the box and the moulding material poured around it. Gentle tapping of the sides of the box will encourage release of air bubbles.

Casting method

The same box can be used for casting. Ensure it is on a level surface. Pour sufficient to create a slight meniscus. Resin can be tinted with pigments and filled with a variety of fillers. Filling reduces the inevitable slight shrinkage of the setting resin and can change the feel and quality of the finished cast. Alternatively the casting can be sprayed to requirements afterwards.

Finishing tips

With coarse abrasive paper taped to your bench surface or with a belt sander, abrade the meniscus until level with the edges of the cast knob. Find the centre of the back and drill a pilot hole. This is best done using a pillar drill and with the casting supported by the mould. Slowish speed, don't force the drill and lubricate with paraffin or WD40. Most holes reach well into the knobs to within 2mm of the front. This cannot be achieved with a standard drill's cutting angle, so an end-mill cutter can be used finally to clear the material remaining due to the drill angle or you might consider regrinding an old quarter-inch or 6mm drill to a very shallow angle.

The grub screw hole can be drilled and tapped using the point on the casting where the original was.

Postscript

Phil's brother was a dental technician and he taught him a bit about moulding. For example, it is possible to do it under vacuum, and he used a lot of different materials using the wax replacement to make crowns and bridges with dental gold. Now we are seeing some good CNC milling machines that can grind intricate details and also 'fabbers' - machines that can build up deposits of, for example, molten plastic using a CNC XYZ axis and following a computer program. Dentist can also have some amazing system with 3-D photography machines that can grind new teeth from blanks with a CNC machine. So all this new technology will stem into machines, software and shared programs to make all sorts of things. We are entering into an age where we will be able to have a machine at home which can create almost any 3D object (including radio knobs!) and we could share, download and buy the programming and multiple users can build upon the designs of things. We are going to be able to copy and replicate many parts. We are entering into an interesting new chain of events around this sort of technology.

