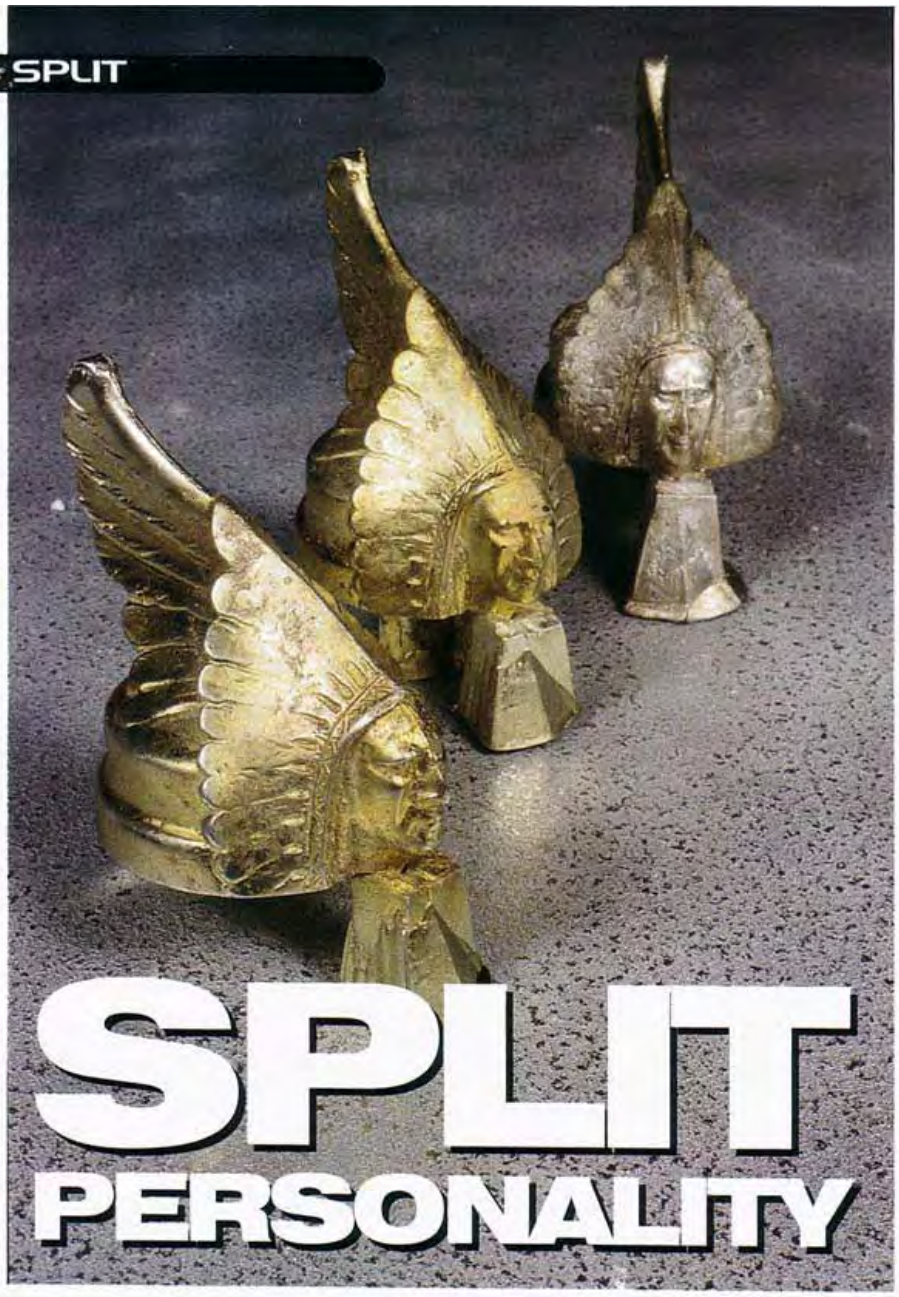


SPLIT PERSONALITY

Story & Photos–Paul Tuzson

REGULAR readers will have seen the series we've been running on resins, fibreglass and composite materials in general. A couple of editions ago we demonstrated the technique of making an open silicon rubber mould suitable for flat objects like the reproduction floor-mat we made.

Deeper, more complicated shapes, like the Pontiac radiator cap emblem shown here, require the two-part split mould technique which we're about to demonstrate.

When Peter from Solid Solutions told us there were metals with a low melting temperature (300º) that could be poured into silicon rubber moulds, our ears pricked up. Besides an opportunity to replace parts on restoration projects, this technique would allow us to design and make original features for a project car.

Bear in mind too that the sort of mould we're about to show you can be filled with various resins and used to make custom vents, bezels, knobs and dials — just about anything that would ordinarily be moulded from plastic.

The front two Indian heads shown here are made from pewter, while the one at the rear is cast in JA12. The reason the pewter is gold is simply that making the mould took a day longer than we expected, so we didn't get time to polish it for photography before we went to press. However, once pewter is polished, it retains a reasonable shine for quite some time without further attention.

Solid Solutions has all the materials you'll need; you can reach them on 03 9579 2044.

1 Here's most of what you'll need for making the mould. The rubber we used for this project is called 3120 RTV. We used it because there was an opened container hanging around, but there's an even better type available called Elastosil M4470, which takes a T37 catalyst. The techniques are the same no matter what you use.

2 The first step is to cut off a block of modelling clay big enough to contain your pattern with a reasonable margin on each side and face. There are all sorts of special clays available but this simple and inexpensive water-based clay is perfectly suitable for the job at hand and very easy to use.

3 Push a rough depression into the clay that will accommodate the widest part of your pattern.

4 A two-part mould needs to be split; therefore it has what's called a parting line. You need to determine which half of the pattern will be in which half of the mould, then sink the pattern into the clay up to this point. Because the Indian head is symmetrical, it was simply a matter of splitting the mould right down the centre of the pattern. Anything hard can be used as a pattern: plaster, wood finished in body filler, fibreglass, just about anything that will hold its shape faithfully throughout the process.

5 Most of the surface of the clay that defines the split isn't critical. However, the point at which the clay butts against the pattern is vital. Any gaps, voids or other irregularities will be reproduced at the parting line on the finished work and will have to be cleaned up manually, so it's much better to get it right here. Make sure every detail along the parting line has clay firmly set against it. Also, make sure the clay stays down at the parting line. Any that finds its way up the sides of the pattern will be reproduced in the metal. A sharp knife gets into the finer spots.

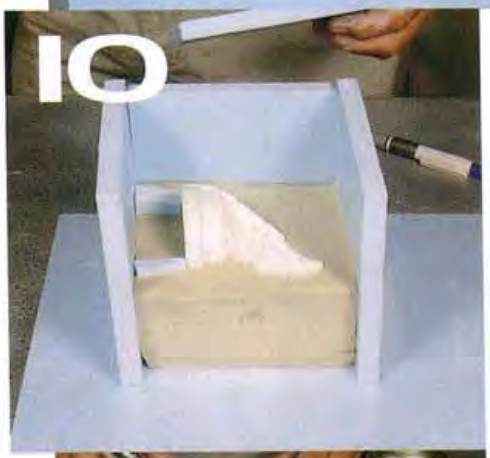
6 We decided to make make the pattern with a hollow section in the centre to take a replacement radiator cap. It's just as well we did because it provided a perfect opportunity to show you what a bad idea that was. We'll tell you why shortly.

7 The metal has to get into the mould from somewhere. Dave from Solid Solutions cut a couple of bits of foam shaped like square funnels and set them into the clay in contact with the pattern at the entry and exit points for the molten metal. Although the parting line for this pattern was symmetrical, it doesn't have to be. If your pattern is complex, the parting line can rise and fall as the shape dictates. It's all just a matter of where you build up the clay.

8 Some people go to a great deal of trouble to box their moulds in but it's not always necessary. As Dave showed us, the four bits of foam shown here did the trick nicely. The top of the mould is defined by a line running across the tops of the sprues as shown. Each opposing side should be roughly equal.

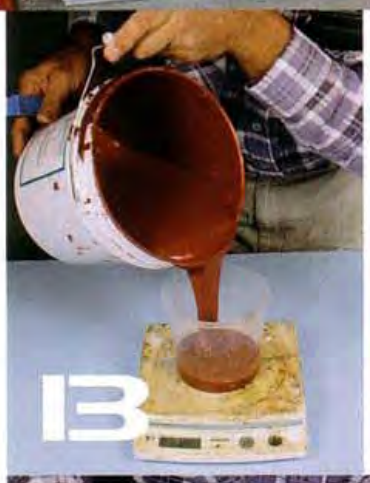
9 & 10 Cut the sides off square as shown, then fit the foam walls. It's important to leave enough space between the edge of the pattern and the foam. Rubber will fill this void and if you allow it to become too thin it won't be strong enough to support the metal and will distort as the metal is poured.

11 Some form of registration is needed between the two halves of the mould. Spray some release agent onto the tip of the paintbrush, or whatever you're going

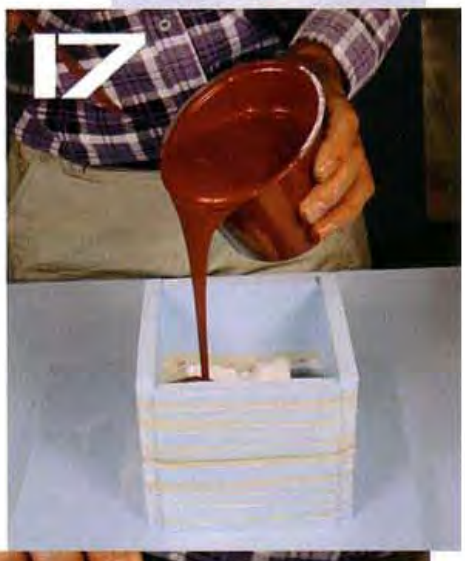


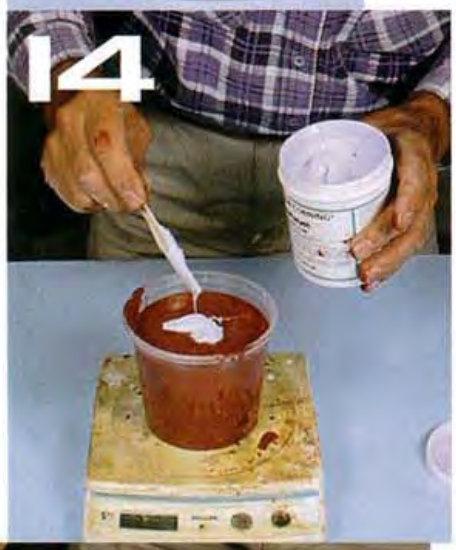
to use, and simply make a series of indentations as shown. Something with a domed form is best.

12 Tie the whole assembly together with plenty of rubber bands and make sure the clay is sealed against the sides of the foam as shown. You need to measure the volume of the cavity to determine how much rubber you'll need. Measuring and multiplying length by width by height will give you the volume in cubic centimetres (if you use metrics) which can be readily converted to litres. This is fine if you want to measure out the rubber by volume; however, Dave prefers to do it by weight. This involves looking up the weight per litre on a data sheet and multiplying it by the volume you've calculated. He feels this is easier and more accurate. In this case, the volume occupied by half of the head wasn't that significant.



13, 14, 15, & 16 Pour out the measured amount of rubber, add the required amount of catalyst and mix them thoroughly. Unfortunately, the very process of mixing introduces air bubbles. This material is thicker than Elastosil M4470 so it takes longer for the bubbles to rise to the surface. One method of getting rid of them is to enclose the mixed rubber in a vacuum chamber, but we don't have enough room in this article to show you how to make one. In any case, Solid Solutions now recommends M4470 for the application we're showing you here.





17 Start pouring. Dave says it's best to pour at one point and let the rubber work its own way around all the parts of the pattern rather than waving it all over the place. Pouring should be fairly slow, about the rate shown. This allows the void to fill thoroughly and also helps break some of the bubbles as they pass over the lip of the container.

18 Here, Dave is checking to make sure the highest part of the pattern is adequately covered by rubber. As it turned out, he felt it needed a little extra to be on the safe side, so he quickly mixed a bit more and added it. Even with this thicker rubber, bubbles weren't too much of a problem because they tended to rise in the mould away from the surface of the pattern. The rubber takes a day to cure, so this is the end of the first day's work.

19 It's the following day, and the clay has to be dug out. Sometimes you'll be lucky and it'll come out in fairly large lumps, but this wasn't our lucky day. Care is needed in removing it — if you dislodge the pattern from the rubber you'll have almost no hope of getting it back in.

20 After much painstaking, tedious work, all of the clay has been removed. The clay can be reused; if you seal it properly, along with the unused material, it will keep for years.

21 There will always be some residual clay that can't be removed with tools. This must be washed out with a wet brush as shown. You have to be careful to remove every little bit from even the tiniest crevices, because anything left behind will register in the rubber and be reproduced in metal.

22 Dave had to pull one of the sides of the mould off to get all the clay out from the undercut. After brushing, tip some water into the mould and rinse it out by sloshing the water around a bit.

23 After you've rinsed the mould, dry it thoroughly.

24 Brush a complete coat of Vaseline over the rubber of the first half of the mould as shown. Make sure every part of the rubber is covered, because if rubber from the second half makes contact with any of the first half it will bond and tear when you try to separate the two halves later. While the covering should be thorough, it should only be a thin film with no lumps.

25 Mix the rubber for the second half just as you did the first. Note, though, that Dave used a considerably larger container than before to get adequate coverage from just one pour. This shot marks the end of the second day's work.

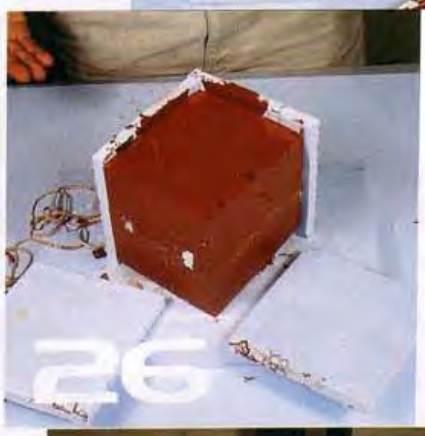
26 Next morning it's time to remove the foam sides. When you cut them it's essential to use a sharp knife along a straight edge so you get straight cuts that butt against each other and form leak-proof corner seals. It's always depressing to come out next morning and find that all your rubber leaked out before it cured.

27 Here's the pattern after Dave split the mould and freed it. That was a short sentence, wasn't it? We have to say it bears no relationship to the effort involved in doing what it described. Getting these blocks separated took no end of twisting and cursing and we can assure you that in this case the wrestling certainly wasn't faked. The problem was the undercut for the radiator cap. In combination with the registry lugs, it made the task extremely difficult. Although the rubber is somewhat flexible it also tears pretty easily — which of course would probably ruin your mould. Firm but careful is the order of the day.

28 We decided that repeating this wrestling match after each pour would be no fun at all. It was also likely to result in a torn mould after perhaps only one pour, so we cut the troublesome sections out of each half of the mould as shown.

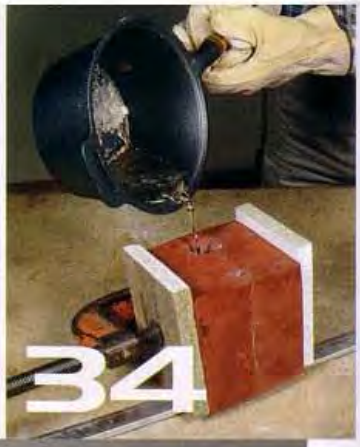
29 Any flashing has to be removed and the mould has to be trimmed generally. This rubber is fairly easy to cut and Dave decided larger sprues would be a good idea.

30 Here's what you'll need to pour the metal. Cast-iron cooking pots like this are available from camping stores but, we're told, they're coated with PVC which should be burned off before you melt metal in them. Set the pot on the burner until it stops smoking. You won't want to do this inside because there's heaps of smoke for 20 minutes or more. You'll see the difference in the pot when you've finished. If you don't have one of these gas rings they cost only $15 or so.



31 A coating of ordinary talcum powder facilitates the separation of metal and mould and also provides a path for gases to escape during solidification.

32 Blow off any excess so that the finished result looks like this. Ideally, the mould should be allowed to cure fully for about a week before you pour metal into it. If you don't want to wait you can set an oven to about 80ºC and cook the mould for around four hours. We recommend not doing this in an oven that's also used for preparing food. In any case,



we didn't have time to do either so we just poured the metal straight into a green mould.

33 With your mould prepared you're ready to start melting. There's nothing much to say about this other than watch and wait. Once it finally starts it goes fairly quickly.

34 Here we go. The metal is heavy and wants to push the two halves of the mould apart. To avoid this happening they must be clamped together firmly. By the same token, you shouldn't do the clamp up so tightly that it distorts the mould. Note how Dave has tilted the mould slightly so that the sprue which the metal will flow up when the mould is fully charged is a touch higher than the pouring sprue. When you see metal fill the second sprue, stop and set the mould flat once again.

35 You can see here how the sprues relate to the casting. As molten metal solidifies it shrinks; this shrinkage has to be fed with molten metal or the result will be distortion of the casting. You can see how the central portion of the metal in the sprue has sunk. This is why your sprues should have generous volumes. Melting temperature and pouring temperature are two different things. When a stirrer stick singes after a second or two in the molten metal, it's about right for pouring.

36 The one on the left was our first pour; despite a bit of shrinkage around the Indian's face, we were fairly happy with it. You can see, though, that there was considerable shrinkage in the centre of the base as well as within the riser. We figured we'd cut another sprue into the mould to feed metal into this section, but we

have to say it still didn't cure the shrinkage. Feeding metal into a mould in a way that minimises shrinkage is a major part of the complimentary arts of the pattern maker and foundryman. The basic rule is that parts of the mould containing mor metal will shrink more. We probably could have solved the problem but the presses wait for no man, so we had to finish up on these results.

37 We tried a pour using JA12 before we cut the third sprue. This metal is supposed to flow much more readily but in this application we didn't like the results at all. To be fair, though, we should point out that Dave also had a mould with a much smaller and much more intricate cavity, and the JA12 filled it really nicely. JA12 also has the advantage of being able to be chromed.

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