CUTTING PC BOARD

HOW DO YOU CUT fibreglass PC board both neatly and accurately to size, so that it will fit in card guides for example?

AS THIS CORRESPONDENT found, cutting with hand shears leaves raw edges and tends to permanently distort the fibreglass, while an unguided hacksaw blade wanders off the required line. I've also tried the old-fashioned lever-blade office guillotine with little more success than hand shears, because the board tends to skid under the sideways force.

Apart from taking the board to a friendly local metalworking shop that has a power guillotine (and whom you can trust to cut accurately to your scribed lines), I've only found two ways that work well.

One is to use hand-operated nibbling shears which cut out a strip of waste material while supporting the board on either side to avoid distortion. With care and a little filing afterwards, you can get a good straight line. The other way is to use a hacksaw with a pair of steel bending bars.

Bending bars are described in the latest *Radio Communication Handbook* in the excellent chapter on 'Construction and Workshop Practice' by Tom Kirk, G3OMK. (This is one reason why there has been so little on metalwork in this column for a while; I felt Tom had said it all!).

Fig 1 shows what bending bars are, and G3OMK describes how to use them for bending flanges and boxes. They are also ideal for such purposes as cutting a clean edge on PC board or aluminium sheet. First you clamp the board between the bars, with the scribed cutting line accurately aligned to top edge. Tip: clamp both the bars and the PC board gently in the vice while you nudge all three items into the correct orientation, and then tighten the bars together using their own bolts then clamp the whole assembly firmly in the vice and use the top of the bars as a guide to saw away the unwanted PCB material.

Do not press the blade closely against the bars; it's okay to leave a ragged edge showing. Finally, file this cut edge flush with the tops of the bars (**Fig 2**). If you have taken sufficient care to align the board correctly, you will have a clean, straight, square edge.

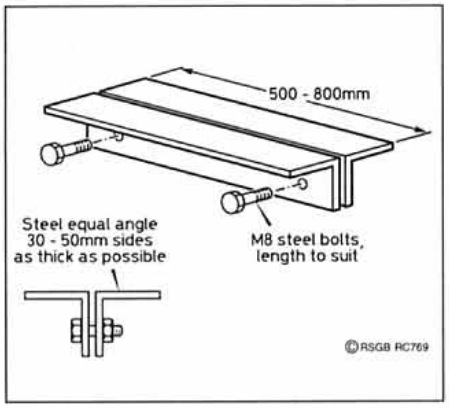

Fig 1: Bending bars - (from *Radio Communication Handbook*, Chapter 16).

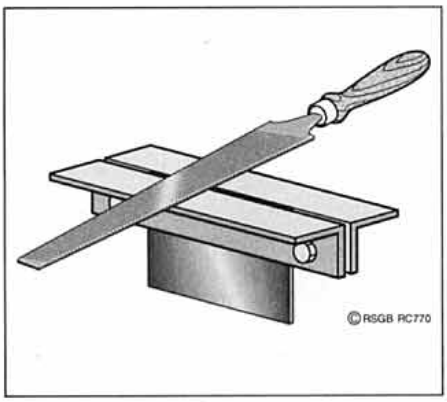

Fig 2: After using the bending bars as a guide to sawing, file the edge of the PC board flush to leave a clean, straight edge (from *Radio Communication Handbook*, chapter 16).

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REELING IT IN

IN AUGUST'S In Practice, G3XAQ challenged us to devise a simple, effective means of reeling in a wire antenna when lowering a telescopic tower. The problem was how to automatically tidy-up and let out 10-20m of slack in flexible wire and/or a string extension of the antenna, applying perhaps 1-2kg of tension.

IT CAN BE DONE! My thanks to G0VKY, GW3JSV, G3VNT, F/GW4WWN, G6TTL, G6XAQ and especially G4HYD for all your suggestions, which I'll summarise below. Radio amateurs come from all walks of life, and being a ship's captain, G4HYD answers this question from professional knowledge. To my surprise, he took up my joking suggestion about a counterweight and a 10-20m deep hole in the ground, but recommended instead a 10-20m deep hole in the sky! **Fig 3a** shows that the counterweight can be suspended from any convenient 'skyhook' (house, mast etc).

If the 'skyhook' is not where you wish to apply the tension to reel in the antenna, a couple of pulleys with suitable anchors provide a remedy as shown (note the use of a spiral 'dog stake' to take the upward pull).

If one end of the wire antenna is attached to the house, it's easy to envisage a single pulley at the top of a plastic drainpipe which

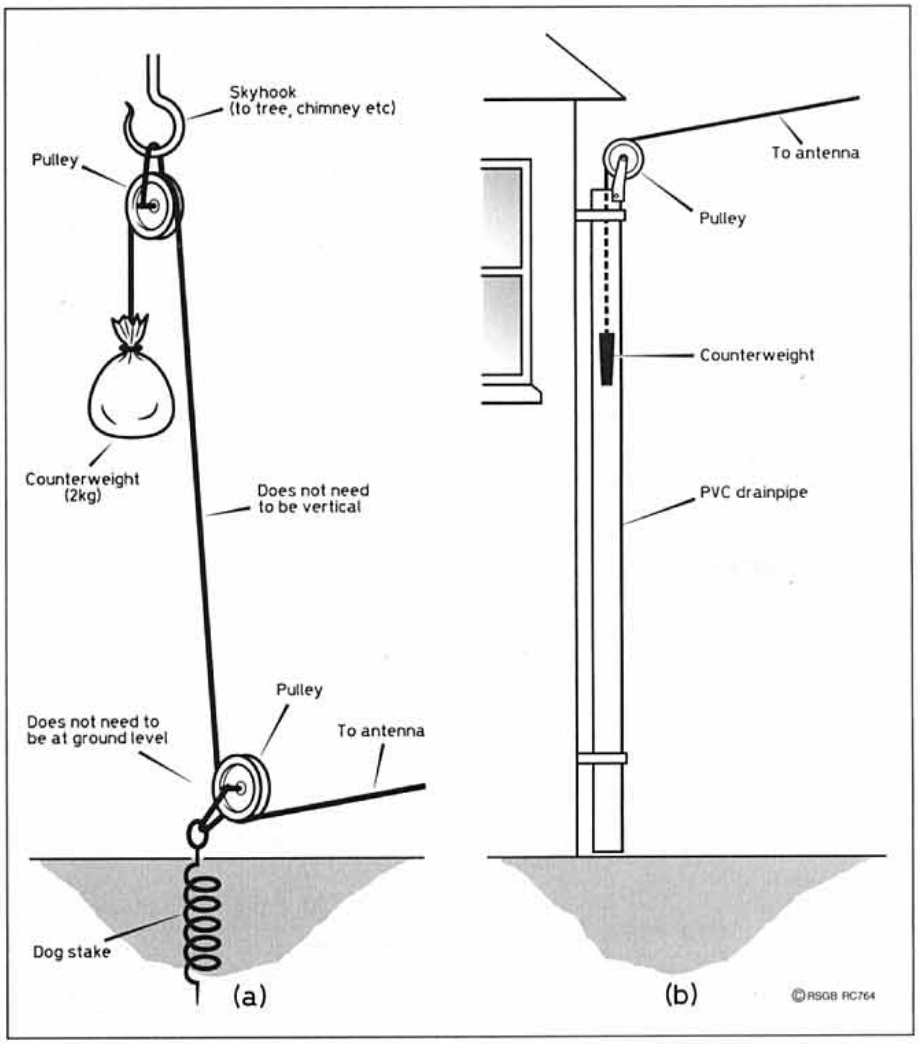

Fig 3: (a) G4HYD's suggestion for a counterweight at any height. (b) Simple derivative for end of wire antenna mounted on house.

holds the counterweight and prevents it from swinging in the wind (**Fig 3b**).

The next step, suggested by many others, is to use pulleys to exchange tension for distance. Neglecting friction for a moment, you can for example generate the required force of 2kg over 20m by moving a weight of 6 x 2kg over a vertical distance of 20/6m, ie 3.3m. As **Fig 4** shows, this requires a 'skyhook' only about 4m high. Unfortunately, it isn't quite as simple as that because frictional forces are also multiplied through the pulley system, so that much of the downward force applied by the counterweight is lost within the system and isn't available to reel in the antenna (a car engine hoist is rather similar, and the friction is so great that a little plastic catch on the loose end of the rope will hold the whole weight of the engine). Therefore, in practical terms you may need much more counterweight than Fig 4 suggests, and the whole system would need to be built quite strongly.

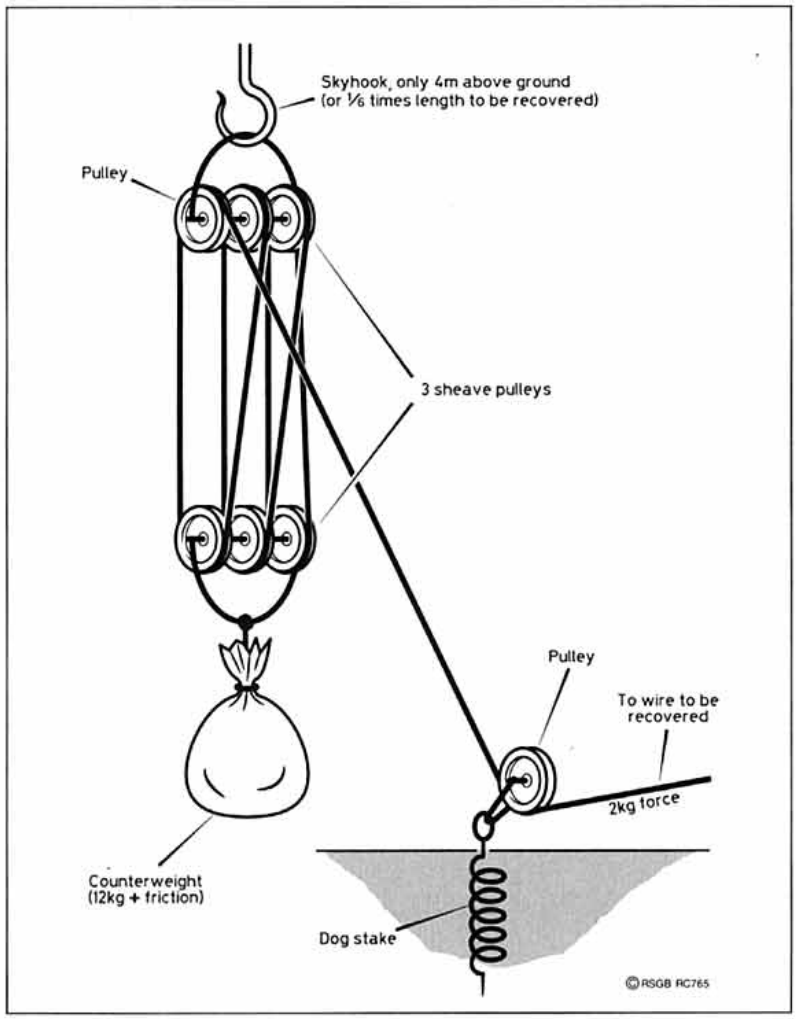

Fig 4: Using six pulleys to multiply the distance travelled by a heavier weight. Note that this example neglects frictional forces.

Yet another idea from G4HYD is shown in **Fig 5**. Once again, the desired effect is generated by moving a larger weight over a smaller vertical distance, but this time using a stepped drum with two diameters. The larger-diameter drum reels in the antenna, while the smaller diameter (which may be the axle) applies the force from the counterweight. Frictional losses in this system can be made very low, and the stepped drum also has the big advantage that it can potentially reel in the antenna guys followed by insulators and even the wire itself, without jamming in a pulley.

Meanwhile, G3XAQ himself has been experimenting with a Hozelock 'Tidyline' 8052, which is a retracting clothes-line reel which winds up a large spiral spring. Replacing the clothes-line, the spring will actually wind up enough to handle 14.5m of thin (2.5mm dia) terylene cord, but sadly it does not produce enough tension, even for a leg of a 22swg 80m inverted-V.

Thus, the antenna still has to be hand-fed into the reel after lowering the tower, so little has been gained. However, G0VKY has had good results with long retractable dog leads: again, these would not be adequate for a long antenna, but work well enough with his G5RV dipole installed as an inverted-V.

Thanks again to everyone who has supplied information and suggestions. So far, the stepped drum seems the most promising DIY option for most circumstances. You're going to need two for a dipole, of course, and for planning purposes the ever-tasteful GM4ZNX suggests they can be disguised as a matched pair of wishing wells - just what your garden always needed, right? More ideas are still coming in so you can expect further updates in due course.

N, BNC?

WHAT DO THE CONNECTOR names 'N' and 'BNC' stand for?

ONCE UPON A TIME, just after the Second World War, Bell Labs in the USA were working on a range of new constant-impedance 50Ω and 75Ω connectors.

The aim was to replace the optimistically-named 'UHF' connector that had helped to win the war, but was already showing its deficiencies at the new ultra-high frequencies. The screw-together N connector was designed by Paul Neill, and the bayonet C connector by Carl Concelman. Both of these were for RG8 cable. Neill and Concelman then pooled their resources and designed not one but two smaller connectors for RG58: the quick-action Bayonet Neill Concelman (BNC) and also the screw-together Threaded Neill Concelman (TNC).

There are many other explanations about the meanings of N and BNC in particular, including "N stands for (US) Navy" and "BNC stands for Bulk(head) Navy Connector", "Bayonet Nut Connector" or even "British Navy Connector", but it's still Mr N and Mr C who deserve the true credit.

All of these connector designs are still around and giving good service including the UHF, the connector they couldn't kill. The C has the advantages of quick-disconnect and a very rugged centre pin, but has largely remained confined to military uses. However, the bayonet designs are not so reliable at cellphone and microwave frequencies, so the TNC has staged a strong comeback in recent years and now appears in regular component catalogues.

CORRECTION

The source of conductive grease for aluminium is Eastern Communications and not Eastern Electronics as reported in last months In Practice. ♦

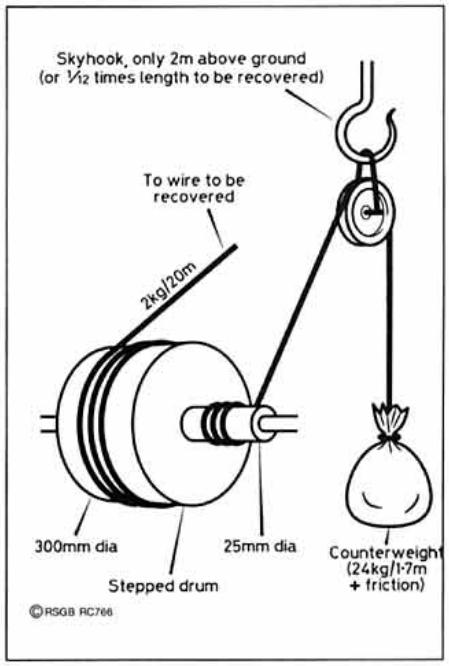

Fig 5: A stepped drum seems the most promising DIY option for most circumstances.

IF YOU HAVE NEW QUESTIONS, or any comments to add to this month's column, I'd be very pleased to hear from you by mail, packet or E-mail (see head of column). But please remember that I can **only** answer questions through this column, so they need to be on topics of **general** interest.