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TECHNOLOGICAL COMMENTS ON AN EARLY ANGLO-SAXON CRUCIFORM BROOCH FROM GRAVE 301, BOSS HALL, IPSWICH

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Summary

An examination of the reverse of the brooch suggests that the extant catch and pin attachment construction are the results of repairs after a miscast. Methods of gilding and silvering were investigated analytically. Casts of an unusual punchmark used on the brooch were examined using electron microscopy.

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Introduction

Grave 301, Boss Hall (Figs 1 and 2) was one of 22 inhumations found during a watching brief carried out by Suffolk Archaeological Unit[1] during 1990. The large cruciform brooch (SF 50/7914) formed part of a well-furnished grave which included a pair of girdle hangers, an annular brooch and other copper alloy fragments.[2]

Examination of the brooch

1) Pinlug, sideknob and catch attachment

The method of sideknob attachment is unparalleled amongst cruciform brooches in England. Examples of other brooch forms of the period may have something similar, although this has not been specifically mentioned by researchers.

There is a practical problem in attaching separately-cast sideknobs of this type; the sideknobs are too flat to be pierced to allow a iron pin to pass through them and then through the pinlug (the normal method for cruciform brooches with separately-cast sideknobs). An alternative method was sometimes used, in which the knobs and the headplate were cast with small lugs along an axis at the back, so that an iron pin could be run across the back (Fig 5). This arrangement was inherently not very stable and casting the sideknobs with the headplate was presumably seen to be a better option, as it was widely adopted for larger brooches.

Cruciform brooches of comparable typology to Boss Hall G301 with the multiple-lug-and-pin style of sideknob attachment include three examples from Suffolk and Norfolk (Mitchell's Hill, Morningthorpe and Spong Hill) and one from Leicestershire (Wakerley).[3] The technique was also used on at least four of Leeds' type C2 brooches[4] found in the Midlands and in the westernmost parts of the cruciform brooch distribution (Baginton, Warwickshire; Brixworth, Northamptonshire; Duston, Northamptonshire; Wychnor, Staffordshire). Their

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[1] Permission to examine and report upon this brooch was given by John Newman, for the County Council. A site summary can be found in the *Bulletin of the Sutton Hoo Society 8* (forthcoming). Illustrations by Donna Wreathall, with further details added.

[2] A full excavation report is being prepared by Christopher Scull, Essex County Council (Planning Dept).

[3] Mortimer C 1990 *Some aspects of early medieval copper-alloy technology, as illustrated by a study of the Anglian cruciform brooch* Unpublished DPhil thesis, Oxford; 253-4.

[4] Leeds E T 1949 *Corpus of Anglo-Saxon Great Square-Headed brooches* (Oxford). Leeds considered these brooches to be square-headed brooches, but the majority of their outline and decoration reflects development from cruciform brooch features.

gilding, white metal plating and zoomorphic ornamentation indicate a late (*ie* sixth century date). The use of double pinlugs may be seen as a technological precursor to this style of sideknob attachment; these are rare amongst early cruciform brooches, with eight English examples (three of which were found in Kent), three from Schleswig-Holstein and three from Frisia.[5]

Instead of using the multiple-lug-and-pin style of attachment, the Boss Hall brooch has a broad, flat strip of copper alloy (1.4mm thick) at the back which must have been soldered into place. Additional stability was given by placing the strip in a channel at the reverse of the headplate (Fig 3). There is an excellent fit between this channel and the copper-alloy strip. The sideknobs were then soldered onto the strip. The strip was cast complete with two well-formed pinlugs. The iron pin probably[6] pivoted on an iron axis between the two lugs, rather than being sprung as was normal for Anglo-Saxon brooches. The extant catch is also a separate item; slight greyness at the back of the catchplate suggests this was soldered onto the catchplate. The simplified bird- or fish-like outline of the catch resembles those on a small number of other zoomorphic cruciform brooches.[7]

Given the poor structural properties of the multiple-lug-and-pin method of construction described above, it is not surprising that there are several examples of breakage and mending amongst brooches using this technique. Many of the repairs are very clumsy and some involve iron rivets which pierce the zoomorphic ornament. The Boss Hall G301 construction, however, may have been a repair after a miscast, rather than a repair after breakage in wear. The neat, well-shaped replacement catch and the good standard of metalworking on all the elements at the back of the headplate (including decoration on the copper-alloy strip) suggest the work was carried out by a skilled metalworker. If the lugs and catch were poorly cast in the initial metal pouring, the areas concerned could be cleaned off and a new construction made, without the need for remelting and recasting.

Visual examination[8] as well as X- and xero-radiography[9] failed to detect any traces of lugs in any of the relevant areas. However, in the case of the sideknobs, cleaning (by filing or other abrasion) before soldering may have been sufficient to remove traces entirely. Similarly, the channel at the back of the headplate cuts through the areas where three of the lugs would have been located. An independant hint of a miscast comes from long recessed lines visible at either side of the bow (Fig 2) which may indicate some misalignment between the mould valves.

It is also possible that the brooch was deliberately cast without a pinlug or catch and that the extant construction was that originally designed for the brooch. The small number of known typological and technical parallels to the catch design make this likely, and it is clear that the metalworker who made the catch knew about the styles prevalent elsewhere. Making the main brooch body without a catch or pinlug would make the mould-making and cast-cleaning processes slightly easier. Nonetheless, it is difficult to understand why such a stable

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[5] Mortimer *op cit*, 263-266.

[6] Mineralised textile obscures detail in this area.

[7] For instance, an example from Empingham G100, Mortimer C forthcoming *The cruciform brooches* in excavation report by J Timby. The catches on both the Empingham brooch and the Boss Hall brooch terminate at the upper end in a beak-like design which curves over the catchplate and into the reverse of the bow.

[8] Visual examination was limited. Although the copper alloy strip and one of the sideknobs were both detached when the brooch was excavated (as seen in the pre-conservation X-rays), these were reattached before the current investigation began. One of the sideknobs was detached from the copper alloy strip succesfully, but it was not possible to detach the strip itself because of the way it lies snugly within the channel.

[9] Kindly carried out by Jo Dillon, AML.

arrangement of the sideknobs and pinlugs - whether arrived at by intention or by necessity - was not adopted more widely.

There is a constructional clue on the brooch which may count against the 'original design' hypothesis. The sideknobs' 'collars' (ie the plain band nearest the headplate) are stepped - this allows the collar to lap over the headplate wing slightly, increasing stability somewhat.[10] In the Boss Hall brooch, now that the copper alloy strip and sideknobs have been restored to their original position, there is a small gap underneath the step (*eg* between the sideknob collar and the headplate; Fig 4). This is unlikely to have been the metalworkers intention as it weakens the construction. In the miscast-and-repair hypothesis, the headplate was thinned in this area (due to the channel on the reverse) and hence the sideknobs project forward from the headplate when soldered to the strip. However, it is possible that the novel sideknob construction was the result of experimentation and the slight misplacement of the sideknobs was an unforeseen 'knock-on effect' of the technique.

Quantitative analysis was not possible at this stage,[11] but non-destructive X-ray fluorescence analysis (XRF) of areas at the reverse of the foot, the reverse of the copper alloy strip and on the catch suggested that all three components are leaded bronzes with small amounts of zinc present. The use of the same alloy throughout would seem to strengthen the case for 'repair' on the same occasion as the original casting or of deliberate manufacture of all pieces at one time.

2) Surface treatment

The gilding on the brooch is in reasonably good condition, although worn in the areas which usually suffer *ie* raised areas and edges. XRF detected gold and a possible trace of mercury in a gilded area of the detached sideknob (Sample area 1 on Fig 1).

The 'fans' on the knobs and at the end of the foot would have been silvered, by soldering thin sheets of silver; on the right-hand sideknob, a small piece of silver remains but elsewhere only solder remains. The identification of the white metal as silver was confirmed using XRF (Sample area 2 on Fig 1); it is not possible to confirm the existence of a thin layer of solder on lead- and tin-containing copper alloys such as this, using a non-destructive method of analysis.

3) Punchmarks

A punchmark with an interesting shape is used repeatedly in various areas on the headplate, catchplate, topknob collar and at each end of the bow. A mould was made of some of these marks on a small area of the right-hand side of the catchplate, using Xantopren Blue dental paste, a quick-setting, easy release moulding material. The cast was mounted on a small stub, coated in gold and viewed in the SEM. Using this technique gives better quality images, especially in areas where examination by visual microscopy is confused by partially-worn gilding.

The punchmarks in this area have a distinctive form (Figures 6 and 7), one that seems to be repeated throughout the artefact. The mark comprises a pair of parallel lines, one of which is thicker and deeper than the other, and of a more uniform width (although it has flared ends); a deep impression is made by the other line at one end only, leaving a rather triangular mark.

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[10] In some cases, although not this one, the stepping also allows the sideknob placement to resemble the topknob placement more closely.

[11] Quantitative analysis may be carried out at a later stage of research.

Comparisons with punchmarks from other artefacts (from this site, or others) could be made to help determine whether any other artefacts were decorated by the same tool, as has been shown in other research.[12] This would require an extensive programme and there would be little guarantee that an exact match would be discovered, due to the problems of tool wear, angle of incidence, orientation, corrosion etc.

Conclusions

The evidence from this brooch provides an intriguing example of the quality of non-ferrous metalworking which was possible in the Anglo-Saxon period. Further work on other artefacts will reveal comparable detail, accumulating to produce a useful synthetic study.

[12] Leigh D 1980 *The Square-headed brooches of sixth-century Kent* PhD Cardiff

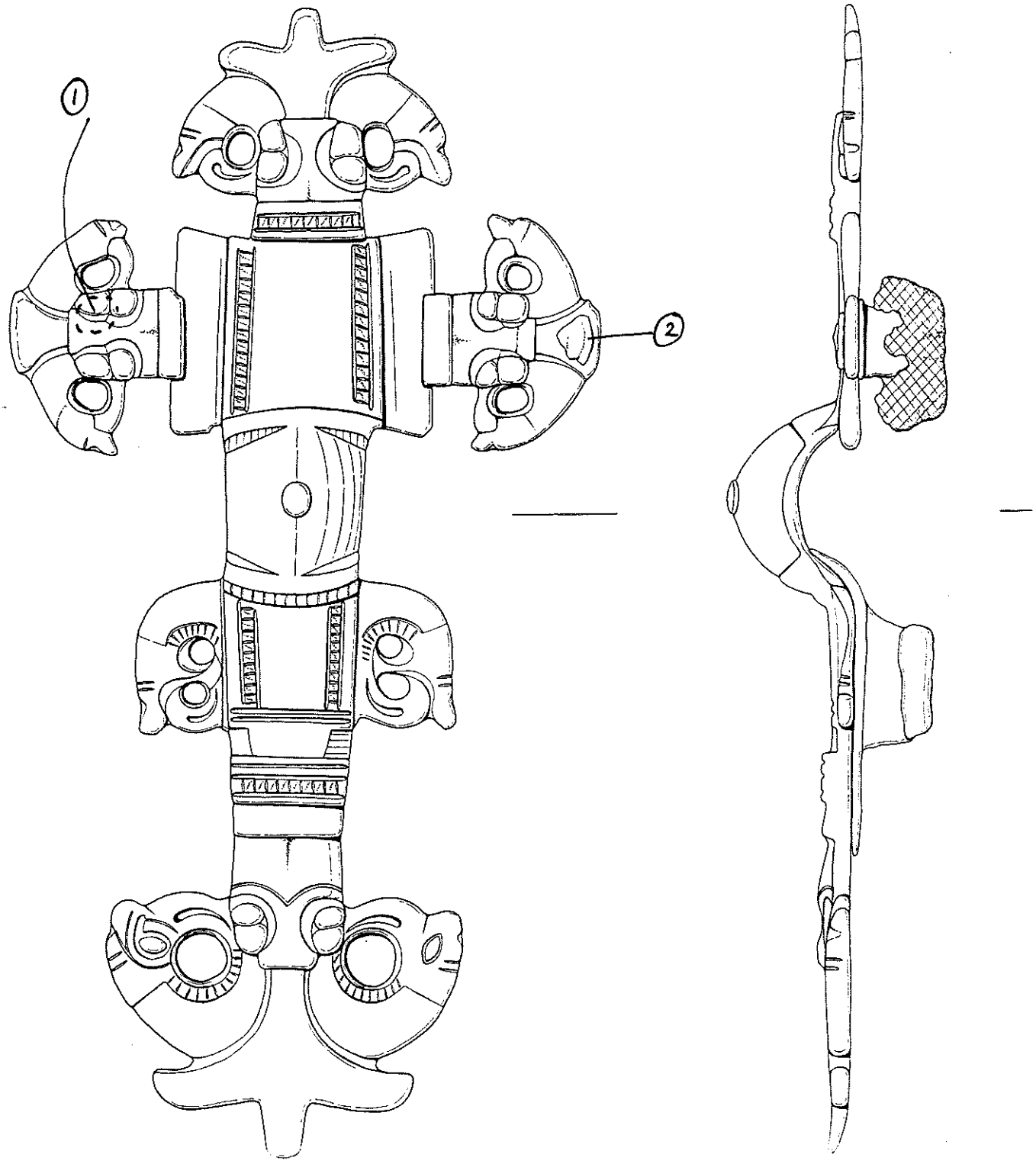


Fig 1: Front of brooch, with sample areas marked

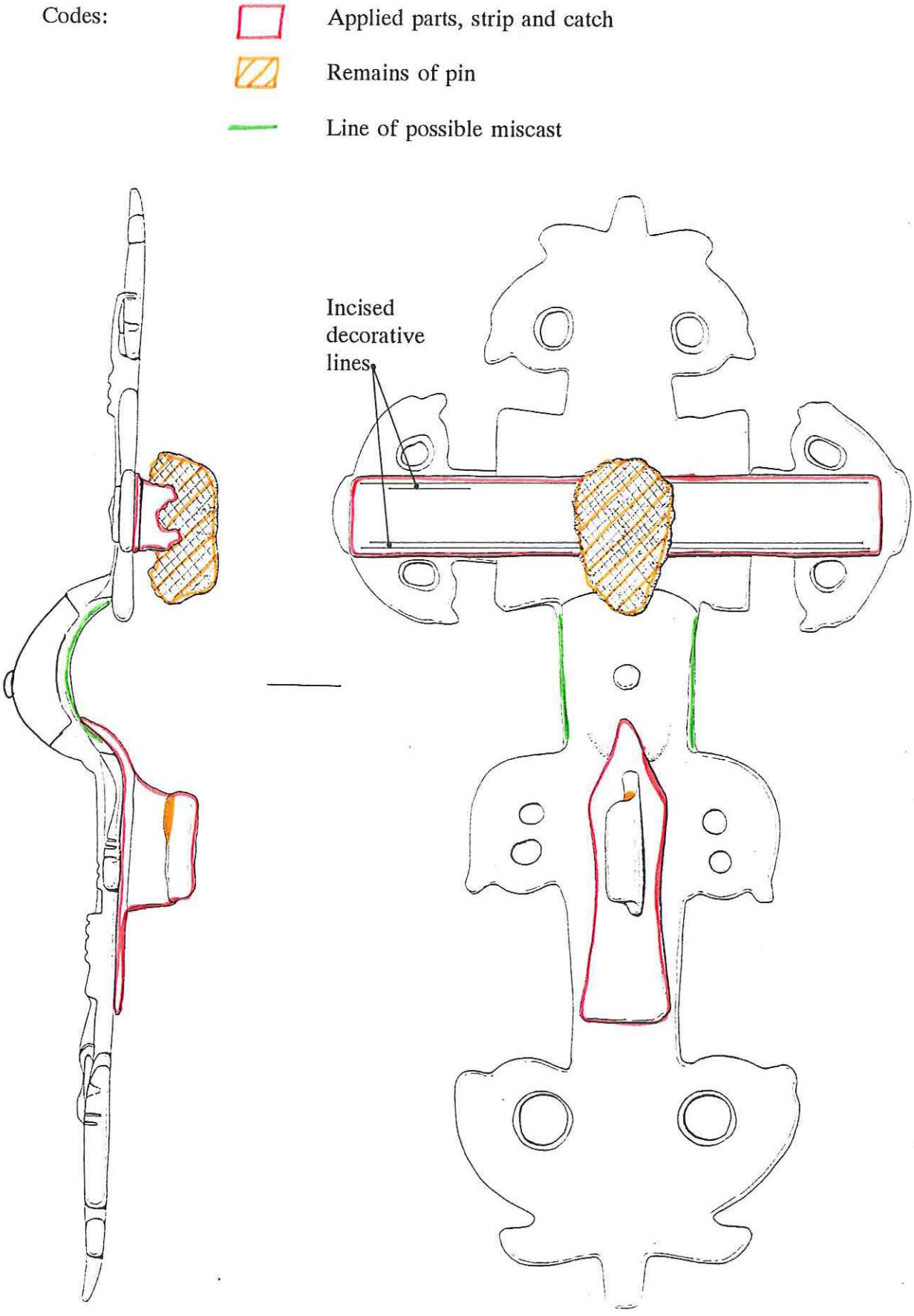


Fig 2: Reverse of brooch, with added features noted

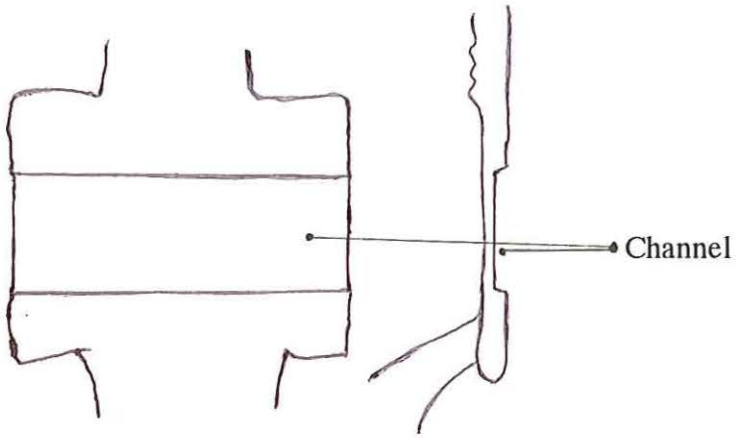
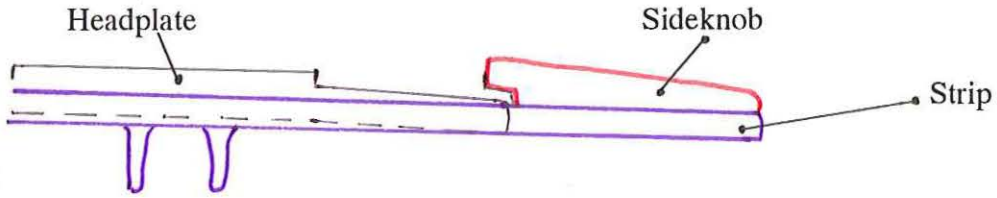


Fig 3: Hypothetical back and side views, without strip or sideknobs



Original line of headplate

Fig 4: Diagramatic section through headplate, strip and sideknob (not to scale)

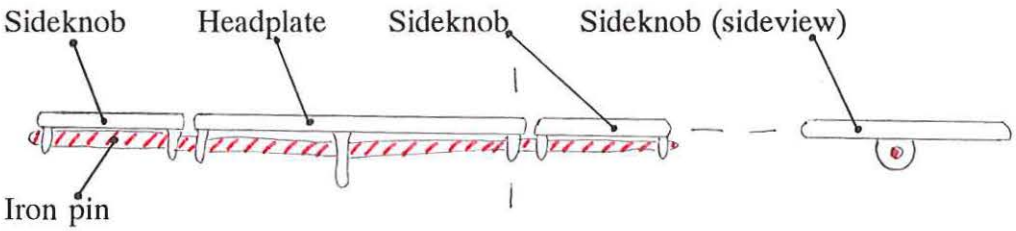


Fig 5: Diagrammatic section through headplate, sideknobs and pin, in the multiple-lug-and-pin method of attachment

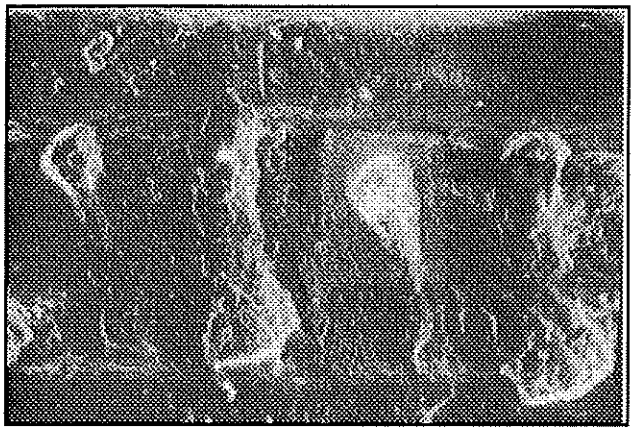


Fig 6: Punchmarks; electron micrograph of gold-coated silicon rubber impression, taken from the lower right-hand side of the catchplate (full width of figure is *c* 3mm).

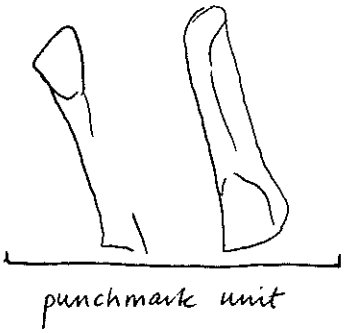


Fig 7: Explanatory drawing of punchmarks, taken from Figure 6