TUMI KNIFE

DIMENSIONS: Width of blade for tumi knives of this shape is typically 19.5 cm

COMPOSITION: Copper with a low arsenic content (0.01-1% As)

MICROSTRUCTURE

SECTION A: Longitudinal section through the cutting edge of the blade.

Photomicrographs

Al -The edge of the knife blade was severely cold worked in shaping it, although the metal has been left in an annealed condition. The grains are recrystallized, equiaxed, and contain annealing twins. Nevertheless, clear indications of severe cold work remain: (1) chemical inhomogeneities in the original cast alloy have become elongated and present themselves as long, thin, parallel bands arrayed longitudinally in the section; (2) tiny pores (black) in the metal have also strung out longitudinally, following the direction of metal flow during working [xl00; Etchant: NH_4OH + H_2O_2].

A2 -The extreme tip of the cutting edge is badly corroded, with little metal remaining. A few grains contain strain lines. But the structure at the extreme tip is basically the same as that shown in A1: fully recrystallized, equiaxed grains with annealing twins [xl00; Etchant: NH_4OH + H_2O_2].

SECTION B: Longitudinal section through the knife handle and upper portion of the blade, where blade and handle meet.

Photomicrographs

Bl -The handle of the blade was worked to shape and the metal was left in an annealed condition. Grains are recrystallized, equiaxed, and contain annealing twins. They are considerably larger in size than the grains in the blade (see Photo A1). Some inhomogeneities in metal composition appear as lighter or darker regions in the structure. Spherical pores (black) distributed randomly throughout the metal are the remains of bubbles in the original, cast material [x50; Etchant: Waterbury (200cc H_2O + l0cc H_2SO_4 + l0cc HNO_3 + l6g CrO_3 + 2g NH_4Cl)].

TUMI KNIFE

B2 -The microstructure of the upper portion of the blade is similar to that of the handle except that the structure is much finer. This fineness results from the blade metal having been worked and annealed considerably more often than the metal of the handle. Upon each sequence of hammering and annealing, the grains recrystallize and become smaller in size. The round pores have also compressed and become smaller as the metal was worked [x50; Etchant: Waterbury].

TUMI KNIFE

INTERPRETATION OF MICROSTRUCTURE

The tumi was shaped from a cast slab of metal through many sequences of cold work (hammering) and annealing. The metal of the handle is closest in thickness to the original cast material, although no vestiges of the cast structure remain. This metal is fully recrystallized and is in the annealed condition. The blade was hammered to a far greater extent than the handle to shape it, although it too has been left in the annealed condition.

The cutting edge of the blade was severely worked to shape it. Nevertheless, after shaping, the metal at the tip was annealed. No final working was employed to harden the tip. It is unlikely, therefore, that this tumi could have been used to cut a hard material.