Extrusion and Re-extrusion of 7075-0 Aluminum T-Sections

Extrusion of a T-section from a round billet at a ratio of 7.3:1 was made (Trial 488) to evaluate the effectiveness of a three-piece T-die design consisting of a die insert, a conical shell insert, and a die case. Details of the design are shown in Figure 2a. The entry-angle configuration was similar to the compound-angle T-die design reported previously(4). The die insert is sized for a hand press-fit into the die case. The die operated satisfactorily and this design will be used for future extrusion of shapes. Its main advantage is that a worn die or shell insert would be cheaper to replace than the whole die itself. It is also believed to be possible for a single-piece die insert to be used in the cracked condition.

Efforts were also directed toward re-extrusion of T-sections previously hydrostatically extruded on the program. The potential advantage of this operation would be to avoid the costly operation of conventional drawing of previously extruded or rolled-shapes to finish dimensions.

During the past quarter, 1/4-inch-thick T-sections (produced earlier in the program) were extruded into 1/8-inch and 1/16-inch thick T-sections at ratios of 2:1 and 4:1, respectively. The results are listed in Table 2.

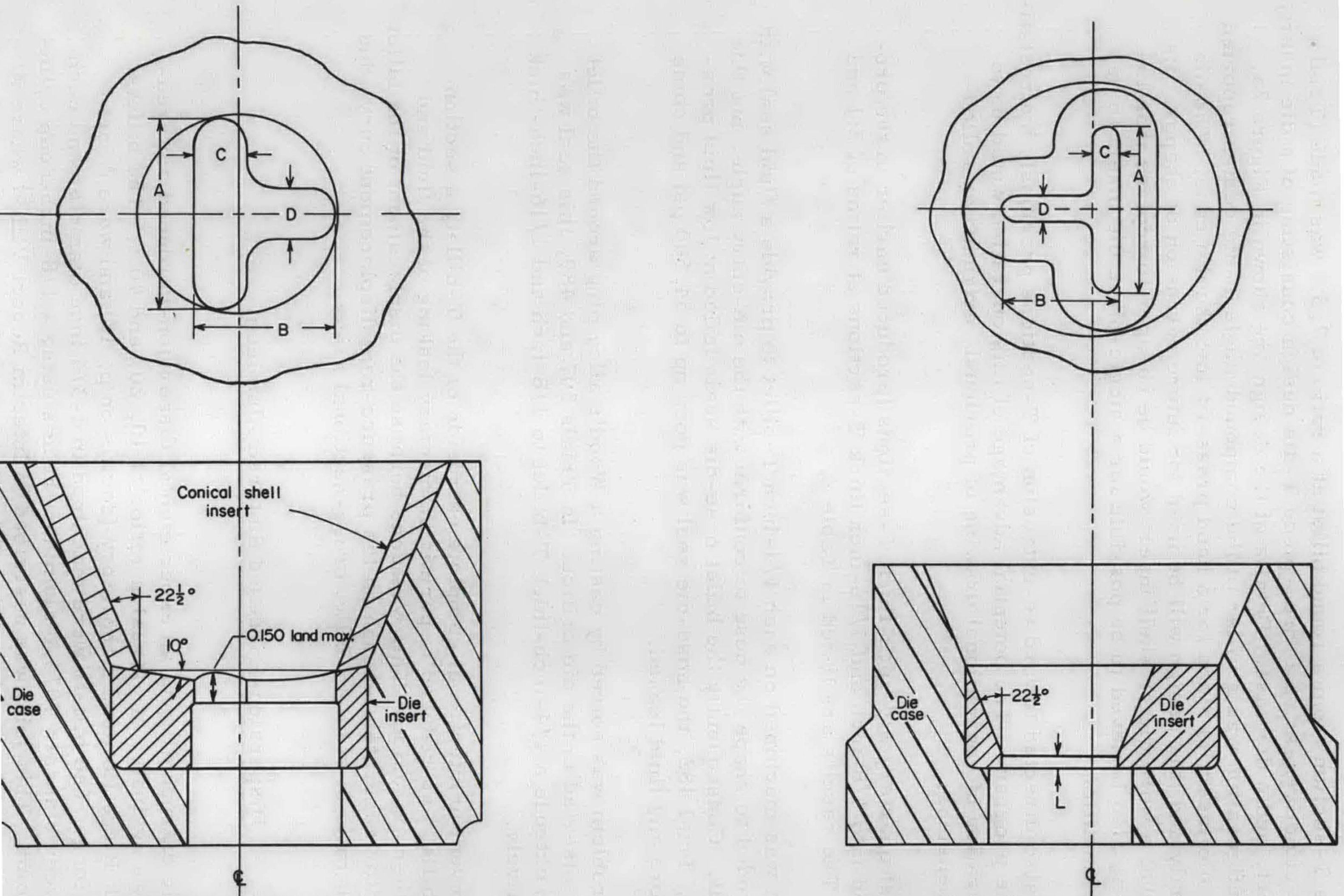
A shaped nose was machined on each 1/4-inch T-billet to provide a fluid seal with the die. It was intended to shape the nose to conform with the die-entry angle, but this proved to be difficult. Consequently the billet nose-die seals failed at low fluid pressures. In one case, Trial 482, the nose-die seal was good up to 34,500 psi and some extrusion began before any fluid leaked.

The sealing problem was solved by casting a Wood's alloy plug around the billet nose while partially inserted in the die orifice. In Trials 507 and 489, this seal was used successfully to extrude a 1/4-inch-thick T-billet to 1/8-inch and 1/16-inch-thick T-sections, respectively.

In order to prevent unintentional complete extrusion of the T-billet, a section near the tail of the billet was reduced to permit momentary leaking of the fluid and thereby prevent further extrusion. This was done because the displacement of the billet was difficult to monitor accurately enough on the pressure-ram displacement curve due to the relatively high ratio of stem-to-billet cross-sectional areas.

Dispersion-Hardened Sintered Aluminum

The hydrostatic extrudability of an experimental dispersion-hardened sintered-aluminum product was evaluated at extrusion ratios of 10, 20, and 40:1. The billets were supplied by Oak Ridge National Laboratory (details on p. 12) and were 2 inch diameter x 2 inches long. The billets were machined to 1-3/4 inch diameter and each was sandwiched between standard 7075-0 aluminum billets using a 1/8-inch-deep cylindrical counterbore joint. This joint was described in Interim Report VIII(6) where it was used in tandem-extrusion investigations. The sandwich-billet construction was used because sintered-aluminum billets were too small to machine a 45-degree nose on one end, and it also permitted complete extrusion of the billets. Lubricant 53 was applied



. Round-to-T-Section Extrusion Die

A	B	C	D
38 in.	0.688 in.	0.250 in.	0.250 in.

b. T-Section Re-extrusion Die

Nominal Web Dimension, in.	A	B	C	D	L
$\frac{1}{8}$	0.875 in.	0.625 in.	0.125 in.	0.125 in.	0.025
$\frac{1}{16}$	0.842 in.	0.593 in.	0.062 in.	0.062 in.	0.020

FIGURE 2. MULTIPIECE T-SECTION DIES EVALUATED IN PROGRAM