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ZINC ALLOY FOR CAST DIES

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Moscow Automobile Plant imeni Stalin

Cast dies of zinc alloy are now being used for stamping automobile parts from sheet metal. This method, which cuts down the tremendous expense and labor connected with the manufacture of the usual steel or cast-iron alloy dies, was worked out at the Moscow Automobile Plant imeni Stalin.

For dies of medium complexity used in drop-hammer stamping, zinc alloys ATs-13-1 (11 - 13 percent aluminum, 1.5 - 2 percent copper, 0.1 percent magnesium) and ATs-13-2 (7 - 9 percent aluminum, 1.8 - 2 percent copper, 0.1 percent magnesium) are employed. Since neither of these alloys showed proper casting qualities or sturdiness in heavy, complex dies (up to 8 tons), research on the physicomechanical and technological qualities of 60 zinc alloys was conducted. In these tests the aluminum content was varied from 0 to 12 percent and the copper from 0 to 5 percent.

Alloy TsAM-5-3 was found to have the optimum combination of properties required for complex, heavy dies. It is composed of 4 - 5 percent aluminum, 2 - 3 percent copper, and 0.05 - 0.10 percent magnesium, with zinc as the base. Impurity tolerance is not more than 0.1 percent lead and 0.2 percent iron. The physicomechanical properties of TsAM-5-3 are as follows: (1) temperature at which crystallization begins (liquidus), 388-386° C; (2) temperature at which crystallization is completed (solidus), 378° C; (3) tensile strength, 23-28 kg/sq mm; (4) expansion, 0.3-1.0 percent; (5) compression strength, 80-90 kg/sq mm; (6) sag under compression, 38-45 percent; (7) Brinell hardness (10/500/300), 110-120; (8) linear shrinkage, 0.9-1.1 percent; (9) number of stampings from steel 1-mm thick, removable without alteration of the die (depending on complexity of the parts), 1,000-2,000.

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Cast dies of TsAM-5-3 can be used for stamping of sheet aluminum, brass, soft steel, rubber articles, plastics, and ceramics. Zinc-alloy cast dies are particularly profitable for series up to 10,000 stampings.

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