Zinc die casting solves jigsaw puzzle

How do you cut cost and trim weight from cordless power tools without reducing durability and performance? This was the question the engineering group at Wen Products, Inc., Naperville, IL, wrestled with as it planned a new line of jig and pruning saws.

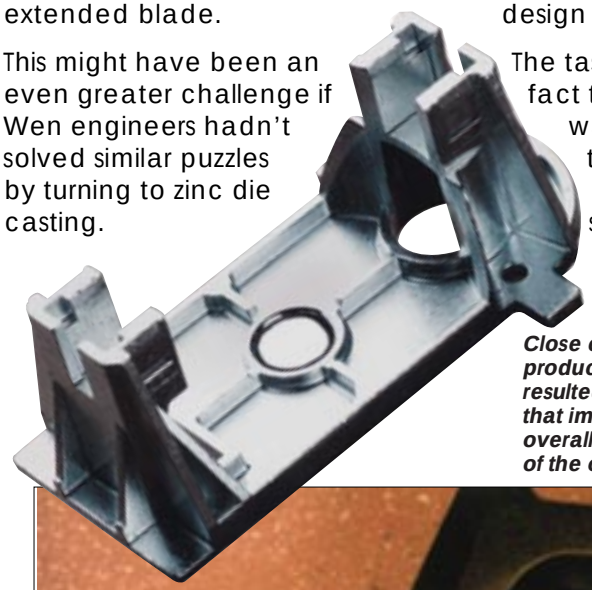
Wen reciprocating saws require a rugged gear drive to convert the rotary power of the motor into the reciprocating motion of the saw. The gear drive utilizes a complex case design which mounts to the motor, houses the drive gears and guides the reciprocating blade. The case also provides the required spacing between the gear and pinion while supporting the overhung load imposed by the extended blade.

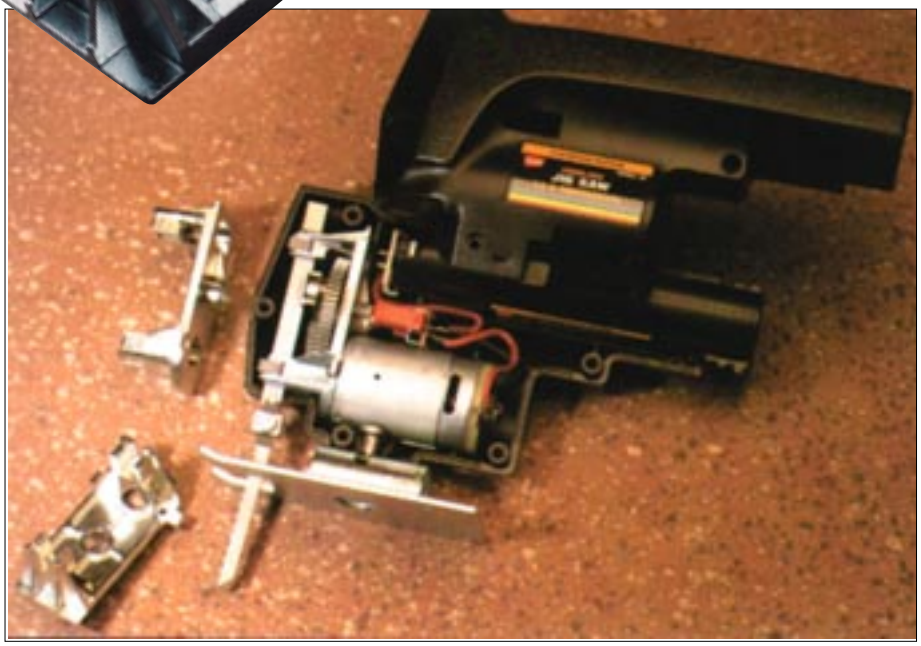
This might have been an even greater challenge if Wen engineers hadn't solved similar puzzles by turning to zinc die casting.

Zamak 3 was chosen from the range of zinc alloys as the one that offered the best combination of castability, mechanical properties and economics. Tougher and more ductile than aluminum or magnesium, die-cast Zamak 3 provides greater design freedom, zero draft and longer tool life.

Once the choice of material and the die casting process (automatic hot chamber) were made, tooling needed to be designed. Close cooperation between Wen's engineering group and the die caster's application engineers resulted in gear case modifications that improved castability and reduced overall cost while leaving the integrity of the original saw design intact.

The task was complicated by the fact that, no matter how the part was oriented, some of the features ended up parallel to the die parting line. This required special provisions to eject the net-shape part from the die. The solution was a four-directional, single-cavity die with movable side cores.





Close cooperation between the product engineers and the die caster resulted in gear case modifications that improved castability and reduced overall cost while leaving the integrity of the original saw design in tact.

Movable side cores, incorporated into the die casting tool, form the intricate features parallel to the major parting line. The most critical of these features are two windows located at the base of each support leg—one rectangular and the other conical. The windows form when metal cores seal-off on either side of the tool. The seal is complete within .0002 in., preventing molten zinc from flashing, which can occur when gaps exceed .0003 in. A total of 21 steel core seal-offs inside the four-directional tool form the complicated gear case configuration. In addition, four submerged side cores are required to form tiny slots on the side of each leg.

Weight reduction and faster casting cycles are achieved through pockets of weight relief in the base section containing the two gear shaft holes and leg supports for the reciprocating mechanism. This reduces the base thickness to .060 in. Ribs are incorporated in the base and legs for rigidity. The ribs also improve the metal flow through the die cavity, allowing the 2.4-oz. gear case to be cast at a rate of 10 per minute.

Two more challenges were met in a single stroke when it was decided to use the critical center hole as the gate location. During the casting cycle, the gating sprue is punched out of the hole by an advancing core rod. As this rod retracts, it leaves the center hole parallel with a smooth surface finish and a dimensional tolerance of ±.001 in. The component is ejected from the tool with the gate removed and ready for assembly.

Tooling was designed and the die-cast components produced by Fishercast, Peterborough, Ontario.