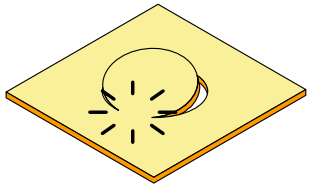
WERCSolutions

Problem - Cause - Solution - Innovation

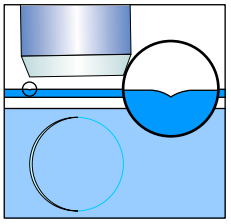
Category: Diemaking Problem Title: Punch Diecutting

PROBLEM

The Machined Steel Rule Die Punch is an engineered tool, which is a great asset to the diemaker and the diecutter. However, as with any precision instrument it must be used with the same degree of attention to detail that went into the design and manufacturing of the punch.

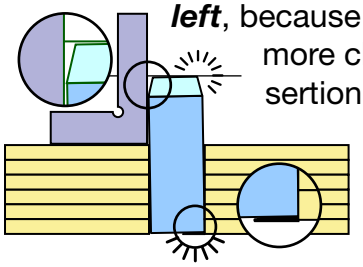


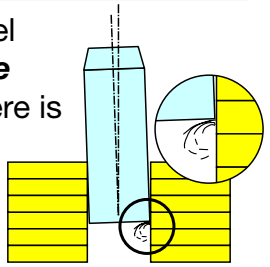
The first sign of a potential problem in diecutting is the generation of poor or incomplete diecut punch holes. ***See above right***. When the die and the specific punch is examined, the cutting edge often shows partial compressive damage, ***see left***, however, often the loss of edge sharpness, is in only one segment of the punch cutting circumference. This is generally confirmed by examining the cutting plate at the conclusion of the production run, where marks and surface damage show less than the complete profile of the cut edge. ***See right***. So what is causing this problem?



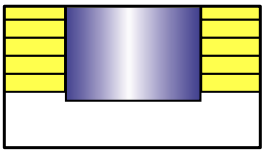
CAUSE

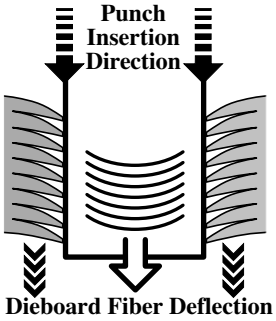
What is most important in integrating a punch into a steel rule die? The first issue is the verticality of the cavity, ***see left***, because if this is not perfect, the punch will be off its feet, and there is more chance of insertion damage. The second issue is the insertion of the punch into the dieboard. If the cavity is slightly to small, or the cavity is not cleanly cut, and the diemaker is not very careful in insertion, the base of the punch gouges the wall of the cavity as the punch is inserted. ***See above***.



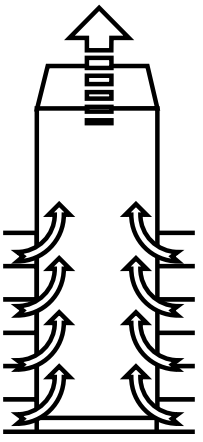


What we are looking for is perfect seating of the punch, with no damage to the walls of the cavity, or any debris driven down into the cavity, which can undermine the clean, precise seating of the tool. ***See right***. What makes punch insertion into a plywood dieboard so potentially unstable is the direction we choose to drive the punch into the dieboard from.





When we drive the punch into the cavity from the top of the dieboard, the lasercut cavity has to be tight enough, or very slightly smaller than the body of the punch, to make sure the punch is secure in the dieboard. When we hammer the punch into the dieboard, we are actually deflecting the wood fiber and the veneer layers, downward. ***See left***. This tension will obviously try to prevent the punch seating and it will subsequently try to push the punch out of the dieboard.



However, if the punch is inserted from the back of the dieboard, ***see right***, the fibers and the veneer layers are deflected toward the top of the dieboard, and the tension in the wood fiber will attempt to pull the punch back down in the direction from which it was driven into the cavity.

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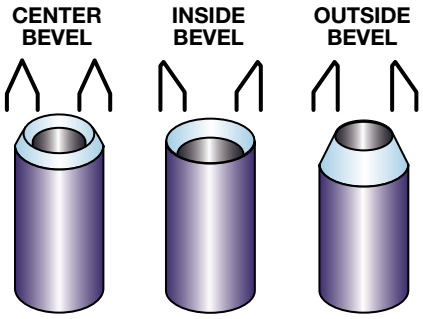
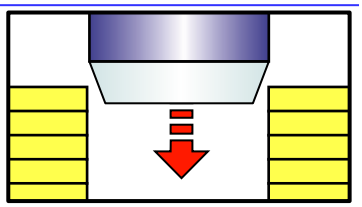
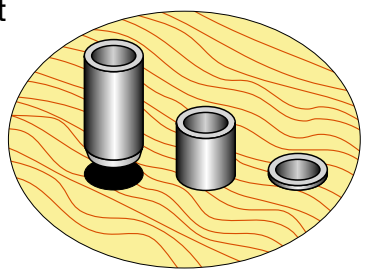
SOLUTION

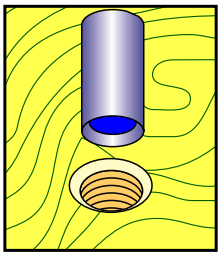


The premise of this problem description is, to eliminate many of the problems with punches, they should always be inserted from the back or the rear of the dieboard. ***See right***. As all punches have some degree of a bevel or a taper at the cutting edge, ***see left***, this means it is very easy to start the punch, and the taper ensures, the insertion is straight and consistent. ***See right***.





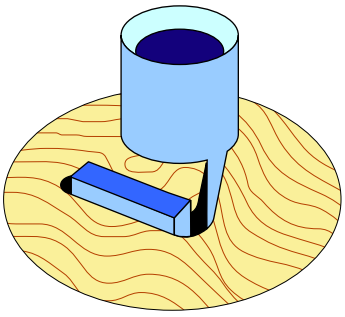
As an added refinement, it is an advantage to use a simple hand tool to slightly countersink the base of each punch aperture, which will make it simpler, faster, and more effective, when inserting punches from the rear of the dieboard. ***See right***.



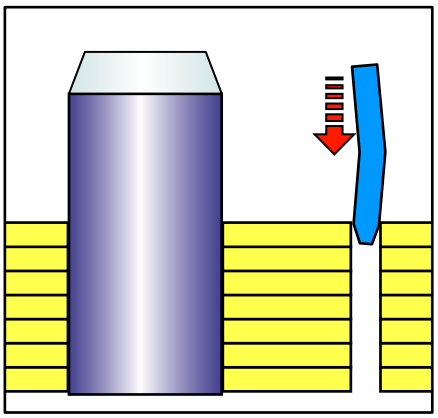
Inserting punches from the back or the rear of the dieboard should become a standard operating procedure.

INNOVATION

Clearly the goal of integrating a punch into a dieboard is to set the punch as simply as possible, and as cleanly as possible. This is often difficult, because precisely controlling the kerf width and cutting a perfect circle is not always that easy using a high power laser dieboard cutter. One of the ways to eliminate all of these problems is to use the inherent resiliency of plywood, to create a ***"Dieboard Punch Lock." See left***.



This is accomplished by cutting the circular cavity for the punch, but beside the punch and connected to it with a diagonal cut is another kerf slot. The punch is inserted into the cavity, and a spacer rule is driven into the locking kerf slot. This drives the adjoining plywood against the punch body, locking the punch into position. This technique has the advantage of being able to simply insert and remove a punch from the top of the dieboard with little difficulty, and with the knowledge the punch is secure in the dieboard and perfectly seated for optimal diecutting. To further enhance the security of the punch in the dieboard and to prevent the spacer rule failling from the dieboard, the spacer rule should be bent slightly, so it applies greater lateral force, and it can act as a shock absorber. ***See above right***.



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