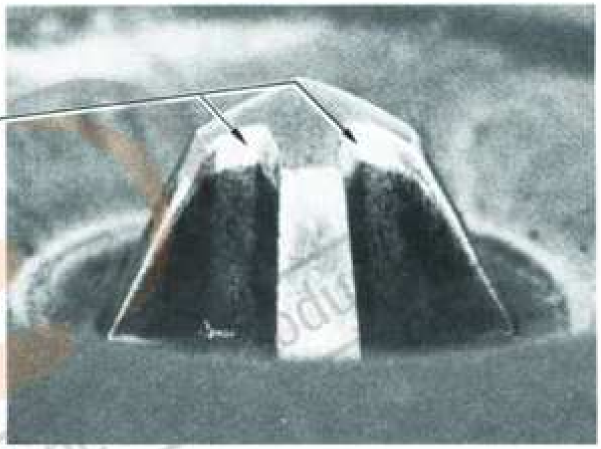
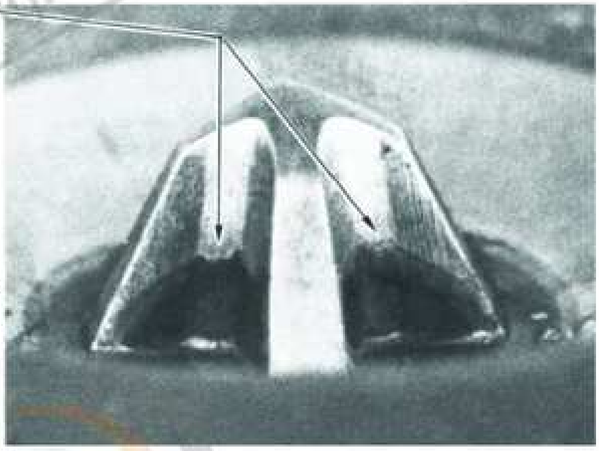
HOW TO READ PUNCH WEAR

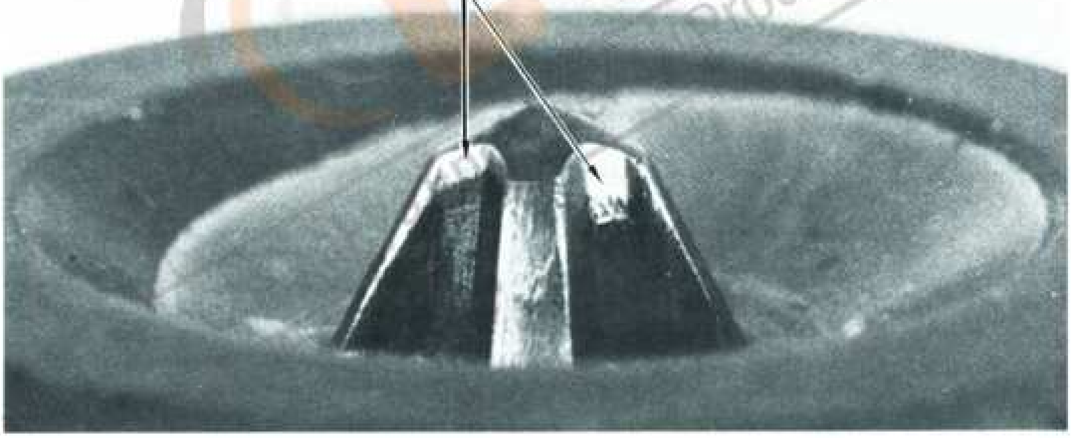
This punch has made 6,000 screws. It tells a good story about the header and tooling. The bright areas at the edges of the flutes show normal wear. The worn areas shown here are nearly identical on all flutes. This indicates the wear pattern on the nib (and the forces) are uniform and evenly distributed over the entire nib. A wear pattern like this is desirable.



As the punch runs longer, the wear pattern moves farther into and down the flutes. This nib has run 60,000 screws and is almost worn undersize. The wear pattern is still uniform.



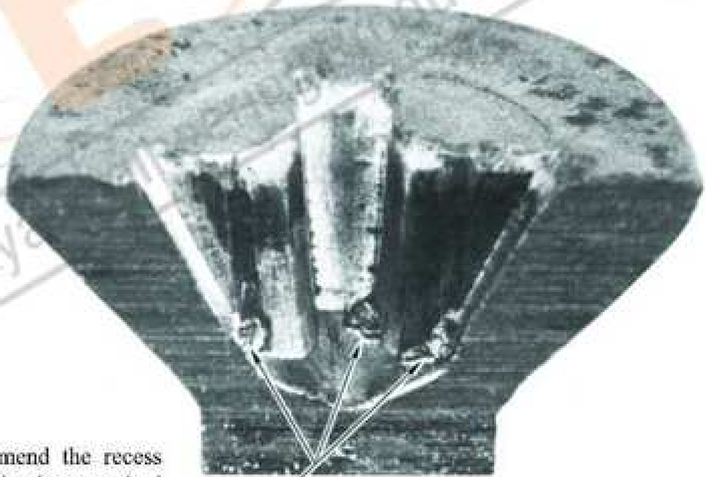
This punch shows an uneven wear pattern. Note the difference in the shape and size of these shiny areas. This punch is destined for earlier failure. What causes uneven wear patterns? Mostly looseness, eccentricity and out-of-squareness. Let's check these three conditions.



LOOSENESS (lack of proper fit)

Excessive looseness can occur in these areas:

1. Punch fit in case.
2. Case fit in holder.
3. Holder fit on punch rocker.
4. Cone punch fit in holder.
5. Wire fit in cone punch bore.
6. Wire fit in die bore.
7. Die fit in die block.
8. Punch rocker fit in bearings.
9. Heading slide fit in liners.



1. Punch fit in case. We recommend the recess punch be pressed into the case. This gives required rigidity and support to the punch. This screw was formed with a punch held in the case by a tangent pin. This allowed the punch to rotate 10°-15° and move endwise .015"-.020". The punch case bore was .002"-.003" larger than the punch. Chipping occurs at about the same location on all four flutes. Punch looseness in the case was eliminated and the chipping disappeared.

2. Case fit in holder. The punch case should be a slip fit in the holder with no excessive clearance.

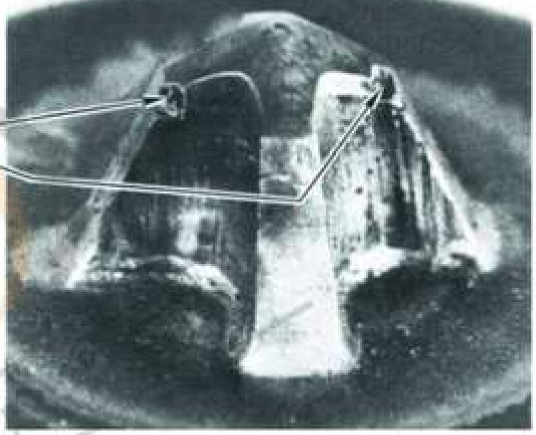
3. Punch holder fit on punch rocker. No looseness. Clamp screws should tighten the punch holder firmly, without rocking.

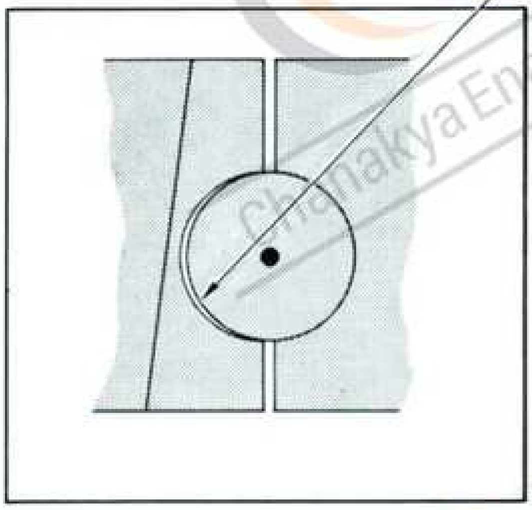
4. Cone punch fit in holder. Slip fit. Sliding cone punches should be well guided in a hardened sleeve. Use only as much slide as needed for the job. (See page 121)

5. Wire fit in cone punch bore. No excessive clearance - bore only .0015" to .003" larger than wire diameter.

6. Wire fit in die bore. Same here, no excess clearance. An easy slip fit without wobble. Bore only .0015" to .003" larger than wire.

7. Die fit in die block. The die block should rigidly support the die. Check the die for taper on the O. D. Check the die block for wear causing the die to be slightly loose. This nib is chipped on the same side of opposite flutes, indicating off-center forces. The cause of chipping was traced to a worn die block. The bore had worn slightly egg-shaped allowing the die to move under load - just a few thousandths but enough to cause nib chipping.





9. Heading slide fit in liners. Check slide clearances with feeler gages.

1/8:, 3/16", 25	=	.002" go, .004" no go
34, 1/4, 31, 5	=	.003" go, .005" no go
45, 56, 5/16", 51	=	.004" go, .006" no go
68, 61	=	.005" go, .007" no go

Use a pry bar to push the slide to one side and check clearances between slide and front vertical bronze liners. See page 119 for proper method of reducing clearance if needed.

8. Punch rocker fit in bearings. For High-Speed Cold Headers, see Maintenance Adjustments Manual. For best results with recess work, end play should be no more than .002" feeler gage clearance between punch rocker and bearing block. Rotational movement of the punch rocker (at front-dead-center with lock screws removed) should be only about .006" indicator reading. Punch rocker bushing clearance, only .001"-.003" micrometer. Check complete punch rocker system. Maintenance Adjustments Manual gives a complete step-by-step procedure.

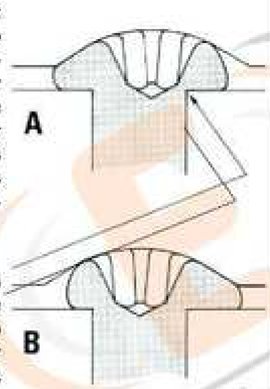
A word of caution here. Before checking heading slide clearance, reseat the die block wedge. Driving the wedge down too far can cause extra slide clearance. To set the wedge properly, first remove the wedge. Place the wedge in position and push down by hand only. Turn the wedge screw down until it touches the hard washer. Turn the wedge screw up one turn. Place the lock nut on top of the wedge screw and tighten. This moves the wedge down a predetermined distance. Whenever setting the wedge, use the same procedure.

Check clearance between top of slide and cap liners. Should be no more than .0015"-.002" feeler gage clearance.

ECCENTRICITY (concentricity-runout)

When the axis of the shank and the axis of the head are not the same, the head is eccentric with the shank (they do not have the same center). This is also called lack of concentricity or runout. Screw tolerances permit a certain amount of eccentricity. For example on a No. 10 pan head screw, the head can be as much as .010" eccentric (.020" Total Indicator Reading - TIR). The recess can have as much as .030" TIR runout and still be within tolerance. This much eccentricity or runout is acceptable for tolerances but not for maximum punch life.

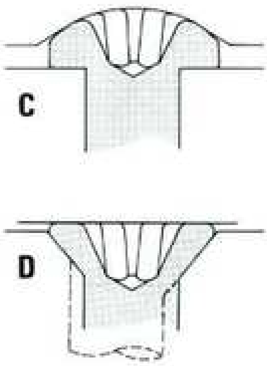
Here are some eccentric conditions illustrated with the punch at front-dead-center. Sketch A shows the recess punch off center. This places the nib closer to the die bore on one side than the other. This thinner section exerts more pressure against the punch thus setting up uneven forces on the nib and probably causing premature failure.



Sketch B shows the insert nub on center. The head is upsetting off center. This comes from an eccentric cone. Here, too, uneven forces affect maximum punch life. You can check the eccentricity of the cone blow upset by using a dial indicator. The less runout, the better. Make final eccentricity checks after the machine is warm and on upsets made AT FULL SPEED.

On-center cone and finish punches make an even upset and place uniform stresses on the nib, Sketch C. This is extra important as head sections become thin. Good setup with on-center punch alignment is essential. Another point to check with countersunk screws is the eccentricity of the countersink. Sketch D.

CHECK ECCENTRICITY OF HEADS AND RECESSES ON SCREWS MADE AT FULL SPEED.



OUT OF SQUARENESS (tools and tool holders)

The nib that made this screw shows signs of chipping at only 6,000 pieces. The chipping was eliminated by shimming the die square (later replacing die block).

This nib shows chipping plus this shiny crescent shape. Finish punch holder was .009" out of square. This caused the punch to hit the face of the die on one side, causing the crescent.

These are just a couple examples of many observed where out-of-squareness caused reduced punch life.

First, tools themselves must be made accurately. Eccentricity of bore & O. D. should be within .003" TIR. Bore or O. D. to ends, within .003" TIR.

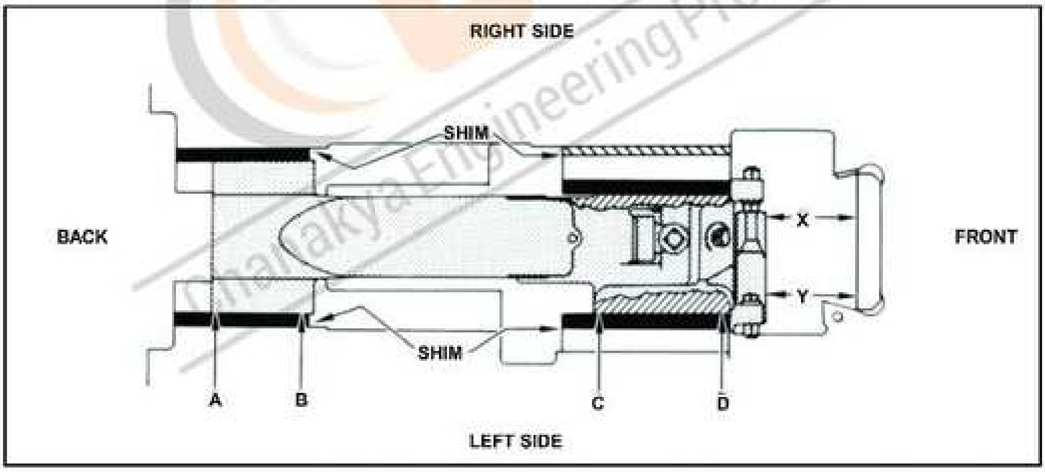
Check punch holder for squareness of bore to seat. Here's how: Remove punch holders from machine. Loosen draw bolt and slide punch out of holder as far as possible and still be clamped. (Preferably use a longer mandrel held full length of the bore). The quickest way to check squareness is on a comparator. If not available, put punch holder on table of good drill press or vertical mill as shown here. Put a dial indicator in the chuck or spindle. Move the indicator up and down along the O. D. of the punch case or mandrel at several different places. Indicator should show less than .001" variation. Also check the punch seat for squareness with sides. Check fillers and centering block with micrometers for uniform thickness. They should provide even distribution of heading loads without tilting the punch.

Check die block for squareness of bore to seat. Remove the die block and die. File or stone the seat (the surface toward the front of the machine against the face plate) to remove rough edges or burrs. Lay seat down on surface plate. Coat die with red lead or similar coating. Push die into one half of the die block, pull out and look at contact area. Die should contact block uniformly throughout its length. Repeat with other half of the die block. If die block does not hold die squarely, temporarily put a shim between the die block and die where needed. Readjust punches. Get a new die block or die.

Keep clean all tools and tool seating areas. Remove accumulations of dirt and wire coating. Pay particular attention to the vent slot under the kickout rod hole in the face plate. Occasionally remove face plate and clean out any accumulation of dirt that has worked into the kickout rod bore in the bedframe.

OUT OF SQUARENESS
(heading slide)

When shimming out excess slide clearances, faulty procedures can cause the slide to run out of parallel with the centerline of the header. An out-of-square slide can be checked as follows. The letters in the illustration below indicate various measuring points.



TO CHECK:

1. Remove die block, wedge and punch holders.
2. Pry slide against left side liners.*
3. With micrometers, measure from face plate to punch rocker at X and Y.
4. X and Y should be equal, plus or minus .001" (0.03 mm).

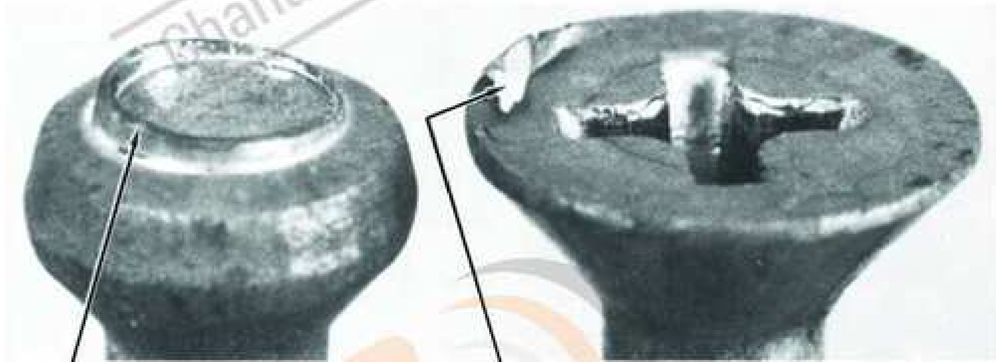
*NOTE: Push on slide near center so that both front and back of slide are against liners.

TO CORRECT:

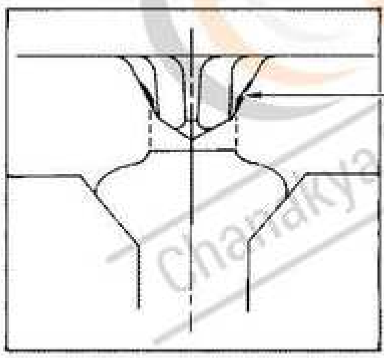
1. Add feeler gages at D. then pry slide against left side liners, until X=Y.
2. Add shim same thickness as feeler gages between left front liner and bedframe.
3. Scrape both left side liners for full bearing.
4. Place .0015" (0.04mm) feeler gages at A, B, C, D.
5. Push slide against left side. All four feeler gages should have the same amount of drag indicating slide and liners are parallel and X=Y.
6. Remove feeler gages.
7. Shim out right side liners to get running clearance (see page 115) and scrape for good bearing.

THE CONE

Don't blame the recess punch for short life that's really the fault of the cone tool. If life is averaged over a group of punches, just a few short-run punches can lower the average. Faulty cone tool can cause recess punch breakage. A chipped cone tool pin or one with crooked ends or a broken pin can contribute to shortening recess punch life by not giving the punch a flat end to enter. Also a crooked pin end tends to upset stock off center resulting in inconsistent upsets. The pin should be made of a good material, fit the bore closely (about .001"-.0015" clearance), be square on both ends and be of the proper length. The upset should be flush at the pin end with as little fin as possible.



The cone tool that made this screw was worn large at the pin bore. Note the heavy ring around the pin. This ring also shows up as a loose fin in the finished screw.



This type of pin ring also contributes to nib wear. By observing recess nibs making heads from a cone with exaggerated pin ring, a definite wear pattern shows up where the nib hits the ring.

Worn pin bore (or pin bore too much larger than wire) is also the cause of wandering eccentricity. If when checking eccentricity of cone upsets made at full speed, some are good while others are eccentric or eccentricity is in different directions, check the cone pin bore for wear or for proper size. The bore should be only about .002" larger than wire diameter.

The height of the cone blank should be slightly greater than the height of the finished head. Head height plus .030" to .060" is rough rule of thumb for cone height. The more stock there is in the cone upset, the higher the cone may be.

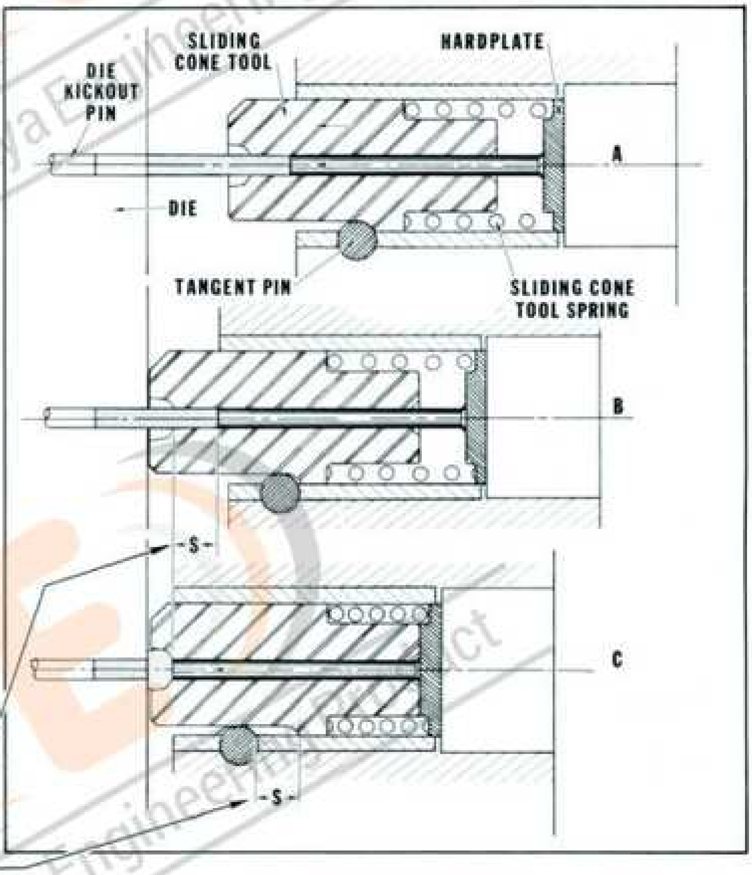
Flat head recess screws sometimes tend to form with the head a round-cornered-square making cone larger in diameter, with a height only slightly more than finish head height, minimizes this.

Be sure the cone tool impression is the proper size and shape for the head being made.

Sliding cone tools are commonly used for recess heads to give added control of metal flow during upsetting. Use as little slide as needed for the job being run. Excessive tool slide means less tool guide, less pin support and more spring deflection. Also length of tool slide must be subtracted from maximum length capacity of header. Less slide means longer parts can be headed.

The end positions of the pin before and after sliding is the amount of tool slide required (shown at S in drawing B). The amount of slide used is the length of the tangent pin slot shown at S in drawing C. The amount of slide used (C-S) should equal the amount needed, (B-S).

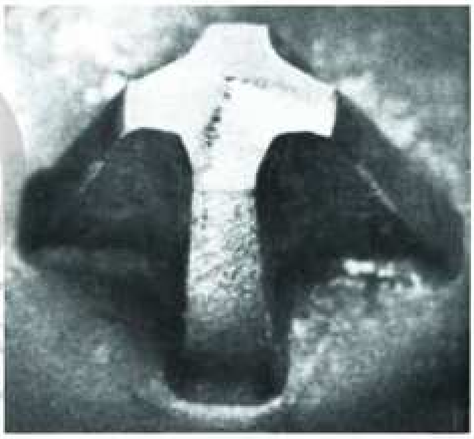
The sliding tool should be lubricated. An air mist of light oil works well and is reported to improve cone tool life. An oily rag tied around the wire as it enters the feed rolls lubricates the wire going into the cone tool bore. The oily rag also collects loose wire coating that can plug the cone tool bore. Check also for good quality cutoff, consistent feed length, distortion of wire by feed rolls and the quality of the wire. The type of wire and processing can also affect cone and recess punch life. Where practical, considering tool size, carbide-inserted cone tool reduces tool wear giving a consistent cone blank. This is of particular advantage for standard screws run in large quantities.



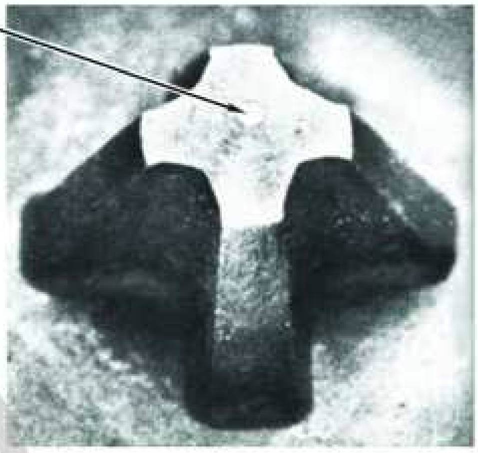
Nib chipping and uneven wear patterns can also be caused by the cone punch during the finish blow. If the cone tool is pounding against the die block it could cause shock or movement of the recess punch. Machine a relief in the die block for the cone tool.

THE RECESS PUNCH

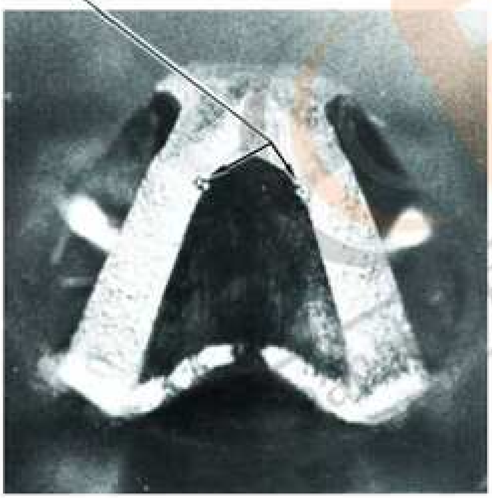
Handle punches carefully. Treat them like the fine precision tooling they are. Don't allow nibs to knock against each other before use. This can cause nicks and burrs that contribute to early failure.



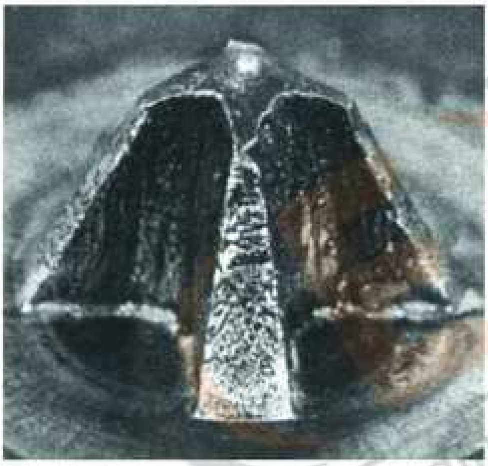
Some head types allow the recess nib to hit the die kickout pin when running without making work. Nibs hitting the kickout pin at full speed fail prematurely. The two nibs at the right have not made work. The top nib is new. The bottom nib shows a flattened tip caused by only two minutes running while hitting the kickout pin.



It is generally agreed that jogging the recess punch over front-dead-center while making work tends to decrease punch life. This punch made less than 30 pieces while jogging. A better setup practice is to make a cone upset then move the recess punch to the upset by hand just enough to mark the upset. Check the mark for concentricity with the shank. When close, make work at full speed for final check. If cone upsets made at full speed are "on center," recess punch eccentricity can be easily checked by looking at the recess width in relation to the ring mark left by the cone tool pin. Ends of recess line up with ring.



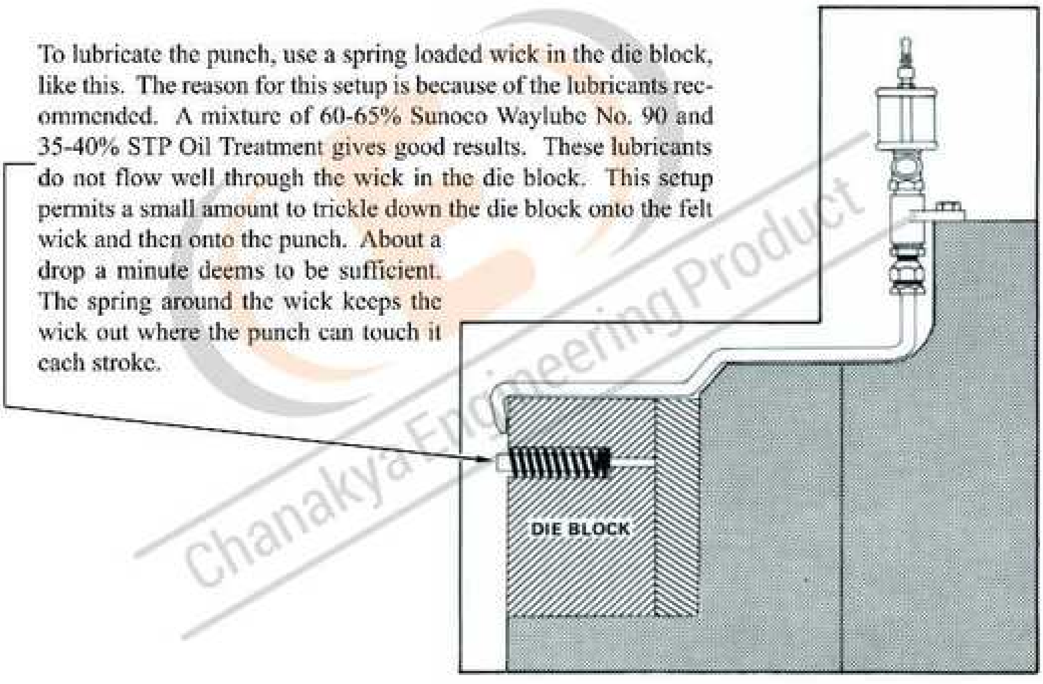
LUBRICATE RECESS PUNCHES



Lubricate the recess punch. This punch made fewer than 10,000 screws. Note the blackness and erosion. Also, the end of this flute is about worn away. This punch was lubricated but with an ineffective type of oil.

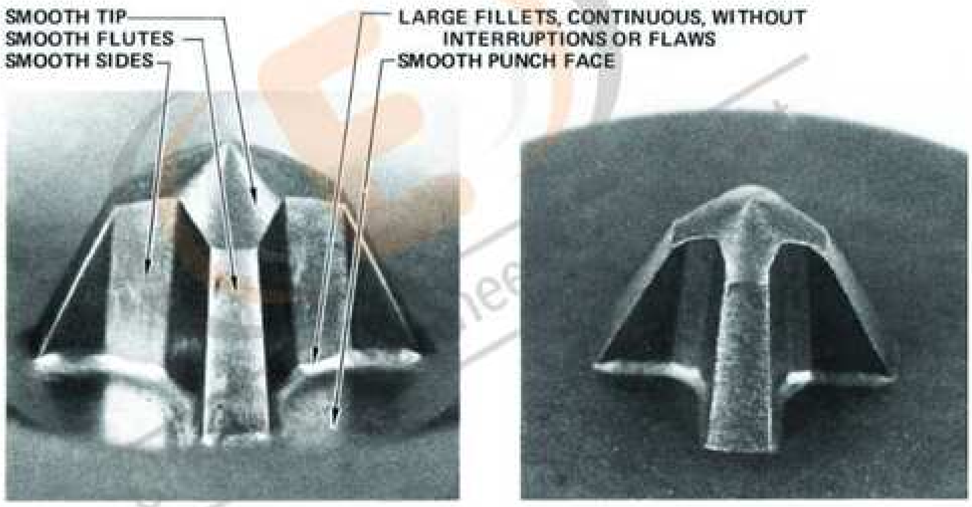
This punch ran 126,000 wall board screws. This may be a bit unusual but this producer consistently averages 60,000 to 100,000 per punch

To lubricate the punch, use a spring loaded wick in the die block, like this. The reason for this setup is because of the lubricants recommended. A mixture of 60-65% Sunoco Waylube No. 90 and 35-40% STP Oil Treatment gives good results. These lubricants do not flow well through the wick in the die block. This setup permits a small amount to trickle down the die block onto the felt wick and then onto the punch. About a drop a minute deems to be sufficient. The spring around the wick keeps the wick out where the punch can touch it each stroke.



USE HIGH QUALITY RECESS PUNCHES

These two punches look good. Punches with these characteristics usually perform well:



Well lubricated punches at 60-66 Rc hardness seem to make longer runs if breakage from other causes is eliminated.

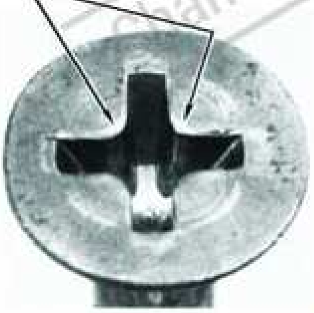
One of the more pronounced differences in new punches is in the surface condition. Punches like those below show a surface roughness or scaling, possibly an indication of decarburization. Watching punches like this run gives the impression there is a soft outer covering that wears away quickly - in just a few minutes - followed by radical surface erosion or nib breakage.

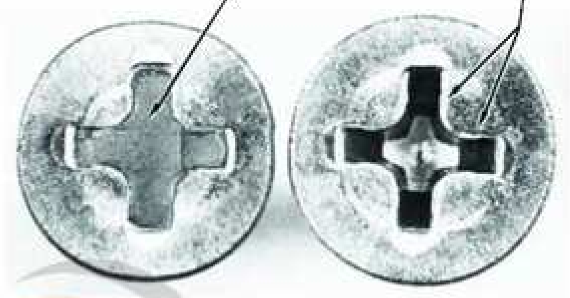
HEADER PUNCH

As in any metal part subject to stress, fillets are important for minimizing stress concentrations. Close observation of punches that fail prematurely indicates that discontinuities of the fillets hasten nib breakage. Irregular fillets can be seen on the nib and in some cases appear almost as a separation of the fillet from the face of the punch.

Odd fillet formation can also be seen on the screw head. In this case the nib is also shown separated at the fillet.

Generous fillets without discontinuities contribute to good punch life and form screw heads with pleasing transition from recess to head.





Finally, let's discuss discontinuities in the face of the punch. These may or may not mark the head of the screw. Sometimes the crack is visible in a new punch. Other times it opens up as the punch runs. In either case, these cracks contribute to premature failure by causing uneven heading loads on the nib, usually indicated by uneven wear pattern and early failure.

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