WHEEL FANATYK

SPOKE CUTTING &
THREADING MACHINE

MODEL M-102

OPERATION MANUAL

MORIZUMI DESIGN

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Features

- Precision shear for length accuracy
- Compound lever for low threading force
- Micro adjustable thread depth
- Toggle switch for gauge change
- 14/15G, 13/14G, or 12/13G
- No-tool disassembly for fast cleaning
- Compact, efficient layout
- Can thread very close (4mm) to blades
- Will make spokes as short as 30mm
- J-bend or straight pull ends
- Good for most materials (SS, Ti...)
- High production rate
- Resistant to damage or misuse
- Individually tested & serial numbered

In the box

1/ Plastic debris tube wrapped with cutting and threading levers.

2/ Scale with hangar and magnifying lens for cutting.

3/ Bag with leveling wedges for bolting to a workbench, shims for threading dies (see pg 8), and removable thread linkage pin.

4/ Bags containing the moving die holder and threading linkage.

5/ Main machine assembly.

6/ Stainless steel base pan pre-drilled for bench mounting.

7/ 250ml Oiler for machine maintenance.

8/ 20X illuminated magnifier for thread inspection.

9/ Operation Manual.

Assembly

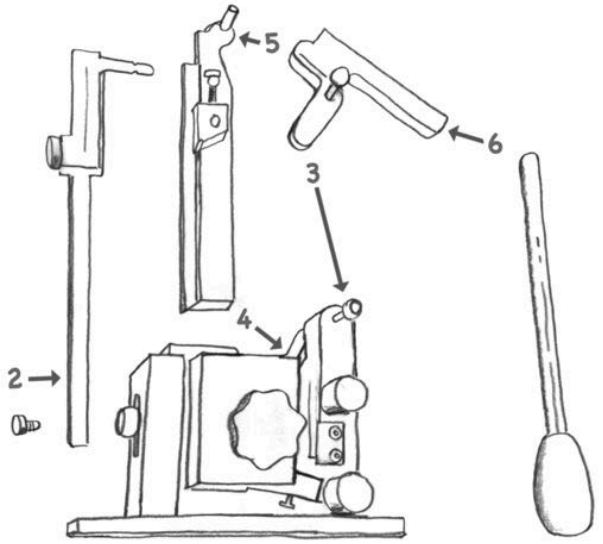


fig 1

The machine (fig 1) should be bolted to a work bench for stability. The plastic debris tube will guide spoke cuttings to a container of your choice, perhaps below a work bench. The base template can assist drilling a bench. After securing:

1/ Attach the size stand (2) with the M4 screw. Notice its height can be micro-adjusted to match the ruler you use.

2/ Slip the threading linkage (6) onto its pivot (3), first oiling the bore and pivot surface. Only light torque is needed for the screw.

3/ After oiling its sides, gently insert the moving die holder (5) from above and guide it to its lower resting position.

4/ Connect the threading linkage to the moving die holder with the knurled connecting pin. It mounts from the right.

5/ Insert and screw the long threading lever into the threading linkage.

6/ Oil all moving and exposed surfaces and you are ready to go. Your machine has been carefully adjusted and tested before shipping. While it is helpful to understand setup and adjustment you can begin right away.

Basic operation

Spokes hang from a notched bar and are cut by a shear moving across a round holder, resulting in an accurate trim.

The spoke (with or without remaining threads) is then inserted into the threading mechanism (use the silver knob to lower the guide plate) where 56tpi (0.45mm) threads are rolled with a downstroke of the threading lever.

The key to a successful thread is straight entry into the dies. The guide block aligns but continue holding the spoke between left hand thumb and forefinger during the thread to stabilize the entry.

NEVER force the threading lever. If resistance on the downstroke is greater than normal, DO NOT CONTINUE. Reverse the threading lever until the Force Return Button can be pressed in. Then raise further to reverse to restart the downstroke. The machine self aligns in most cases. Or extract the spoke and start again.

Don't over tighten fasteners. Use only highest quality allen wrenches. Make sure that all users are instructed in correct operation.

Spoke cutting

1/ Loosen the size stand threaded knob and move the hangar along the scale to the desired length. A red line in the center of the magnifying lens shows length (fig 3). 0.5mm increments are easy to judge.

2/ Hang the spoke elbow over the size stand horizontal rod (fig 2). In the case of straight pull spokes, push the spoke end against the rod neck. Maintain finger pressure on the elbow until the cut is finished and the spoke will not drop off the hangar.

3/ The to-be-cut end of the spoke passes through the hole which is centered in the V-shaped guide below the size stand.

4/ The scale can be micro-adjusted at its base. Loosen the M4 attachment screw and raise or lower the scale with upward-facing adjuster. Match the ruler you use.

5/ Push the cutting lever forward with a quick motion (fig 4) and the spoke will be trimmed with low effort. Like karate or chopping wood, a faster motion needs less force required.

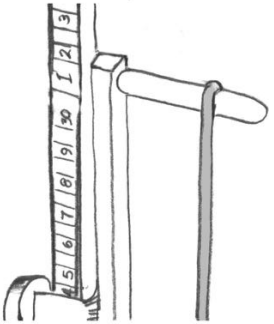


fig 2

Read spoke length
(250.5mm) here

fig 3

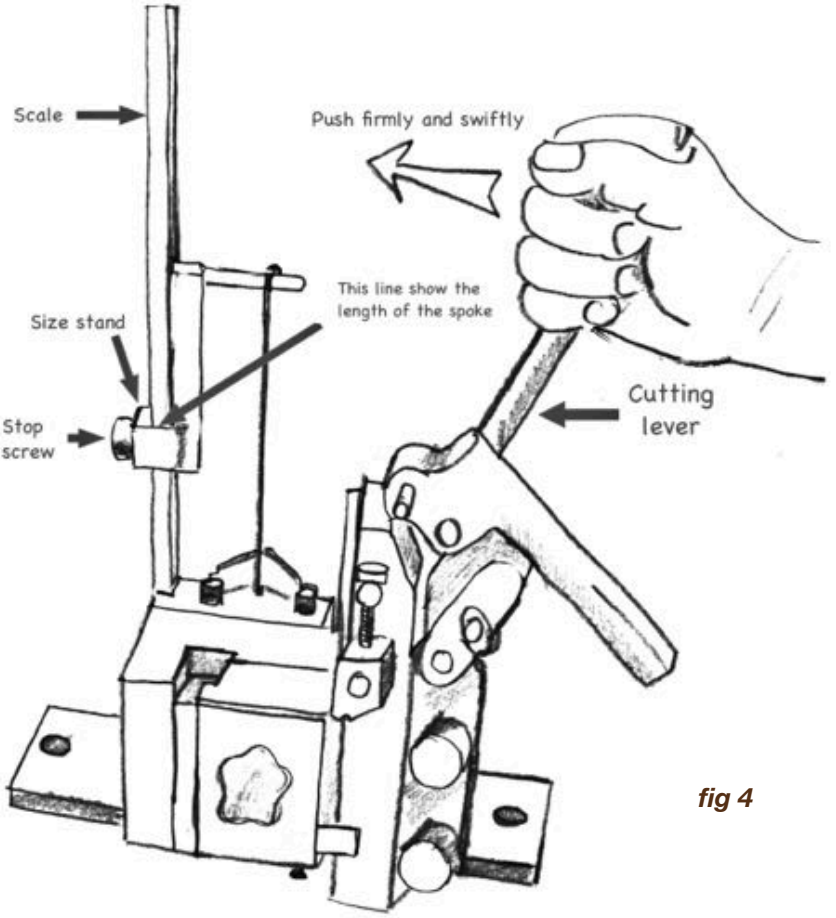


fig 4

Spoke threading

1/ Begin by moving the Threading Lever to full upright position. Two dies face each other, one held by the Fixed Die Holder. The second moves with the Moving Die Holder. This second unit travels up and down with the threading lever.

2/ Press the spring loaded Guide Plate down with its silver knob. Insert a spoke until it meets the internal stopper (see pg 22). If the spoke is not inserted fully, it will not be grabbed by the dies.

3/ Release the Guide Plate so it moves up and holds the spoke securely against the Feed Guide, nested in a groove on its underside.

4/ Now pull the Threading Lever down, raising the Moving Die Holder, and threading the spoke. At the completion of this stroke, the spoke will exit from the top. Threading is complete.

5/ If the spoke does not enter the dies in perfect alignment, the machine will jam or produce an unusable thread. To make it easier for the pickup to be aligned and perfect, keep your left hand gently on the spoke. Hold it between thumb and forefinger and follow it up while threading. This helps alignment.

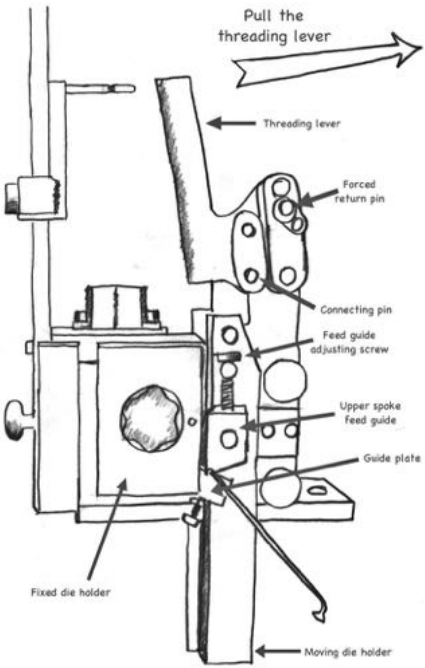


fig 5

6/ If the machine offers resistance or jams, do not force. The Threading Lever can be reversed in direction to return the Moving Die Holder to the start, ejecting a jammed spoke.

7/ The Forced Return Pin (colored red on the machine) must be depressed during the reversing motion. Otherwise, the spoke will not be ejected.

8/ Many keep spokes to be threaded in a conical cup. Each spoke will be easy to grasp and elbows won't become entangled. Keep the pint cup filled about 10mm of lubricant. Each spoke will be lubricated upon entering the cutting or threading areas. No need to separately lubricate those operations.

fig 6

The cup will become unstable with more than 30 or 40 spokes but that is fixed by drilling a block of wood (or bench top) to fit the glass so it cannot fall over. Fig 6 shows a cup with a large base.

9/ To change gauges, loosen the large gauge lock knob and move the gauge switch from up (14G) to down (15G). Resecure the lock knob. Changing to 13G or 12G is covered under "Threading Dies."

10/ It is repeated often in this manual – never force the machine. If an operation suddenly requires much more force than the preceding, stop and examine. While it is difficult to wear out or damage beyond repair, function can certainly be degraded, possibly requiring re-machining of surfaces to continue service.

Maintenance

1/ Oil all moving parts. Over oiling is OK, the machine sits in a pan to collect drips. Keep an oil can handy. Any grade is fine. Many like synthetic middle weight motor oil, as it is inexpensive. We use CLEAR, a food safe lubricant that is rather heavy but works well.

2/ Exposed machine surfaces should also be kept lightly oiled. The black color is an oxide that is not weatherproof. Wipe surfaces with an oily cloth. Clean any dust or debris that accumulates. Consider keeping a cover (pillowcase will suffice) over the tool between uses if the environment is dusty.

3/ Periodically remove the Moving Die Holder and wipe out the machine's interior. Examine the dies and use a stiff wire brush to remove any material lodged in the grooves. Coated spokes produce the most debris. Just brush, wipe, or blow the area clean. When the die needs replacement, its grooves will be rough and eroded. Dies are extremely hard and wear by very small bits breaking loose. Since a spoke rotates 6 times during threading, a worn die may still produce a good thread.

Changing threading dies

Replace both fixed and moving sides. Die life is long, generally 20,000-50,000 per fresh die face. Dies are duplex, double sided (since 2019) and fit SCT's of all ages.

When dies are worn out, first rotate each 180° so a fresh die surface will be available. Dies are 16mm wide, so threading a standard 10mm leaves 6mm of die completely unused. Also, with partially threaded spokes, dies see less wear towards the center so rotating provides new function. Once rotated dies are worn, flip them to an entirely fresh surface and then, later, rotate a second time. This is four wear cycles per die set.

1/ Remove the Connecting Pin holding the Moving Die Holder to the Threading Linkage (fig 7).

2/ Lift the Moving Die Holder up and out of the machine. For the Fixed Die Holder, the large gauge locking knob must first be removed.

3/ Each die is retained by 2 fixing screws. and two set screws from the side. If the die pressure feet screws are too tight, use a highest quality, fully inserted allen wrench. Warming the assembly to 200F can help loosen a stuck screw. Note that the longer pressure foot on each die has a small positioning set screw. It is reached with a long 2mm allen.

If they do not easily drop out, rap the holders on a hard wood surface.

When the dies are removed notice shims beneath. These bring total thickness to the correct number for your setup. Keep these parts clean.

4/ Reassemble with only light lubrication. Any trapped between shims may not be able to squeeze out and add thickness. Set screws are only for location, secure them lightly before tightening the pressure foot screws. Those need not be tight, only firm.

Switching gauges

To change between sequential gauges, use the switch on the machine back. There are three setup options. The best way to measure die/shims thickness is with a micrometer.

Making each side exact to 19.00 (14/15G setup) is not possible with shims so err as little as possible on one side and balance the total with the other. For example, 18.85mm on the moving side is good with 19.15 on the fixed side.

Setup	Total dies + shims thickness	Thickness per side
14/15G	38.0mm	19.0mm
13/14G	37.6mm	18.8mm
12/13G	37.2mm	18.6mm

Notes

1. total thickness is most important
2. divide shims equally on moving and fixed sides
3. moving die is best the thinner side
4. err up to 0.1mm high in total thickness

Press down firmly down to compress the shims fully. Precision is a must. After shimming for your chosen setup, test thread depth. Die shimming is the macro adjustment for thread depth. Micro adjust with the set screws above and below the gauge switch. They have super fine effect so use one full revolution when making changes..

Beginning in 2021 we offer 3 dies, each targeting one of the 3 gauge setups. They are marked on the side. Setup and shimming is 100% the same as when only one die design was available. Any can be re-shimmed to other setups, as before.

Threads too deep cause jams, high lever force, premature die wear, and even cracked and split spokes. To test thread depth, use test spokes. Run them through with a setting you know is too loose and tighten the clearance after testing. Measure the rolled thread OD to know where you are.

Gauge	Rolled thread OD
15G (1.8mm)	2.00mm
14G (2.0mm)	2.20mm
13G (2.3mm)	2.50mm
12G (2.6mm)	2.80mm

Expect thread peaks to have a small flat top. This permits lower threading effort and tolerance for oversized spokes.

While this area of gauge and thread depth may seem complex, believe us, it's easier than adjusting brakes once you are familiar.

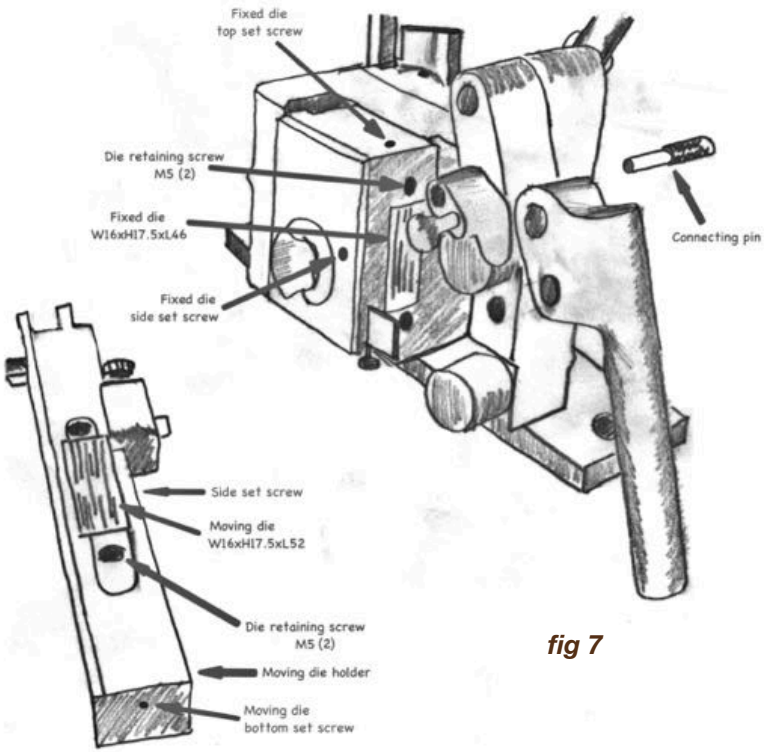


fig 7

Changing cutting dies

Spokes are cut by a shear with a round and square die, each of which can be resharpened many times before replacement. A belt sander works well.

Best cut comes from the square die moving closely across the round die.

1/ Remove the Cutting Unit (fig 8) by unthreading its 2 M6 fixing screws. The round die is retained by one M5 set screw. If necessary, warm the cutting unit body and press out the round die with an arbor press.

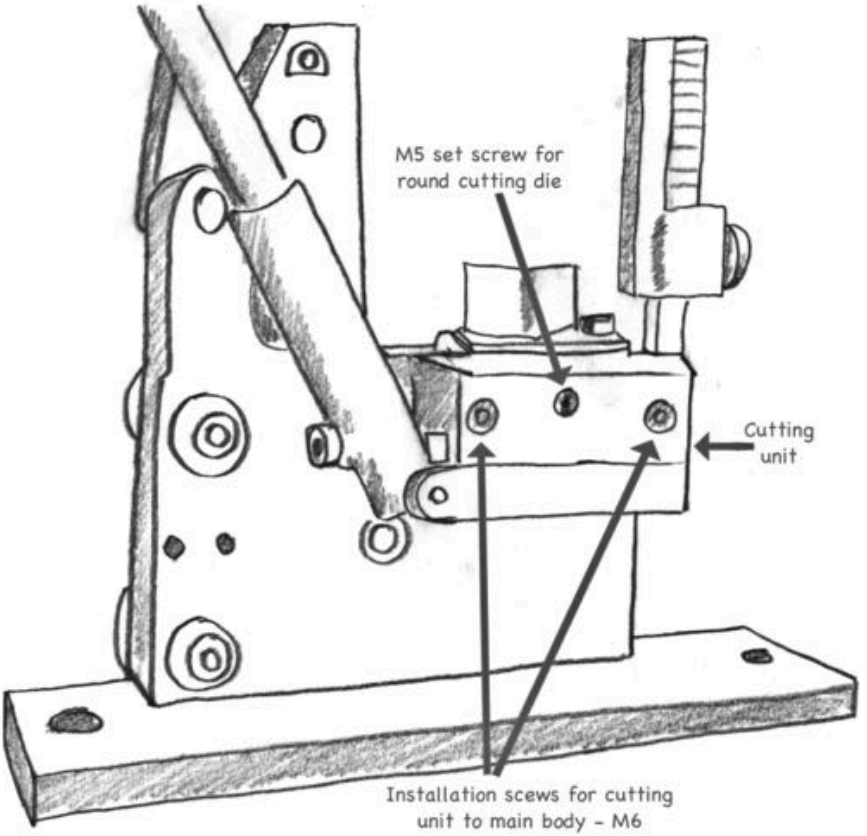


fig 8

2/ Open the Cutting Unit (fig 9) by removing 4 M5 screws. The square die (shear) is in a slot with a spring and pusher. It can be lifted out.

3/ Assembly is the reverse order. If your cutter jams, this disassembly permits brushing out debris to free it up. Adjust the cutter throw (at the lever pivot) so the square die retracts between cuts only enough to clear the bore for another spoke. This allows the die to sweep cut ends down the debris tube and minimize jams.

4/ The round wears faster, developing a notch. Rotate it 90 deg, presenting fresh surface. It can be rotated two more times before removal and regrinding (a belt sander works well). Keep the die cool when grinding.

5/ Once the square die is dulled, it can be ground. A belt sander also works great. Keep the tool cool. Try to duplicate the bottom rake. A sharp die makes a huge difference to cutting quality and effort.

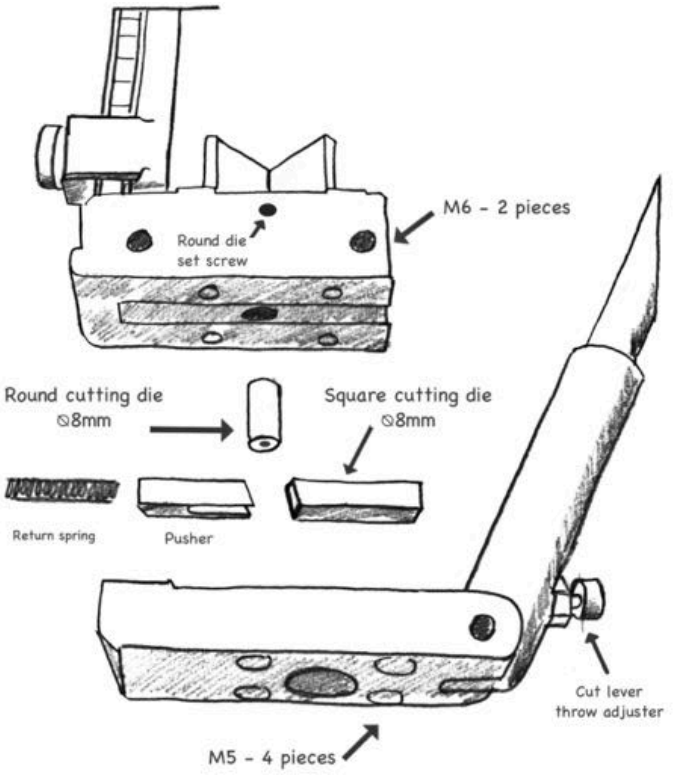


fig 9 - inside the cutting assembly

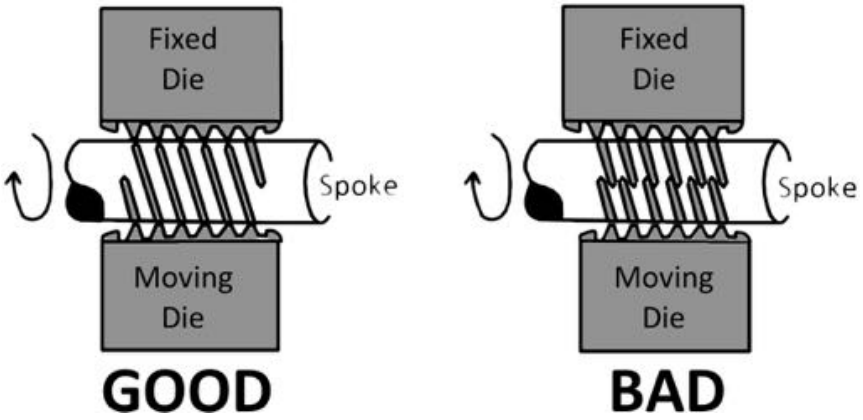
About thread rolling

Spokes have rolled, not cut, threads. Metal is repositioned under high pressure forming valleys and peaks. Advantages are economy (no material lost) and strength (metal grain is realigned not interrupted).

Forces are high and, on a bicycle spoke, tolerances are tight. This requires lubrication, cleaning, and precision. The Wheel Fanatyk machine brings you precision but lubrication and cleaning are the operator's responsibility.

Flat thread rolling employs two opposing dies positioned so their work coincides. Thread timing (relative position), if incorrect, can lead to jamming. Fig 10 shows dies correctly and incorrectly aligned. In addition to jamming, misalignment puts huge side loads on the die teeth accelerating wear.

fig 10 - thread timing



Additionally, the spoke must enter the rolling dies at a perfect, 90° angle. The machine supports and guides the spoke but it may still become crooked on entry. Jamming and damage are possible if a crooked spoke is forced through the threading cycle. Never force the threading function.

Adjust thread timing

The Upper Feed Guide adjusts up and down. Once set it will not normally need attention. This sets the spoke start position and must be precisely set.

The spoke start position, relative to the die plates, is important for both the pickup function and for the exact alignment of the two dies. They each perform one-half of the threading, so the spoke must enter at the correct spot and angle.

The spoke centerline, when located against the Upper Spoke Feed Guide, will be about 3mm below the moving die upper edge (fig 11). This is the place to begin adjustment but not necessarily the right position.

Lift out the Moving Die Holder. Place a spoke into the start position, into the groove on the Guide underside. Does the spoke centerline rest 3mm below the thread die upper edge? If not, loosen the lock screw in the Feed Guide and make adjustments with the knurled screw that faces down. Generally, adjustments of 1/2 to 1 full revolution are best. Secure the locknut.

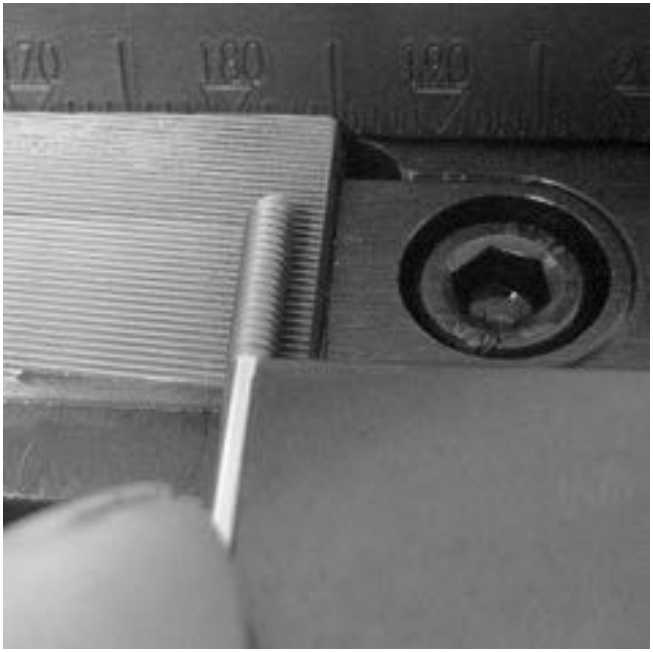


fig 11

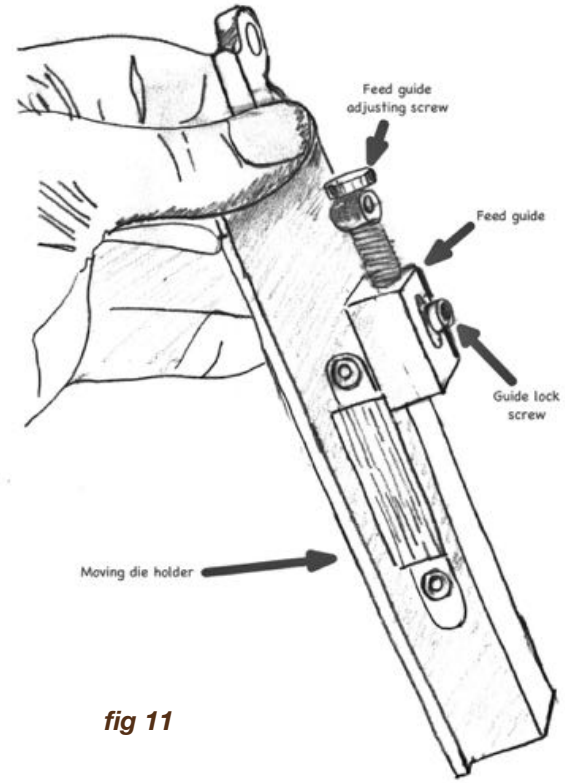


fig 11

To check the adjustment—replace the Moving Die Holder, reattach the Threading Lever, introduce a spoke, pull down on the threading lever until the spoke is picked up and rotates only 1/2 turn (180°).

Stop, press in the Force Return Pin (red) and lift the Threading Lever so the spoke is ejected. Pick up the spoke and examine the partial thread with at least 10X magnification. This can't be done with the naked eye or a reading magnifier. If you cannot see the result clearly, you cannot time the machine.

Examine the partially threaded spoke. See if the moving die thread and the fixed die thread are matched as in figure 13. You will see 2 sets of partial threads approaching each other. Closer they align, the better. Adjust by raising or lowering the guide block. Use half turns of the adjuster until alignment is good.

Initial adjustments will be down (fig 11) for the Feed Guide.

Fig 13 shows bad alignment, as the top grooves are centered between the beginning threads from below.

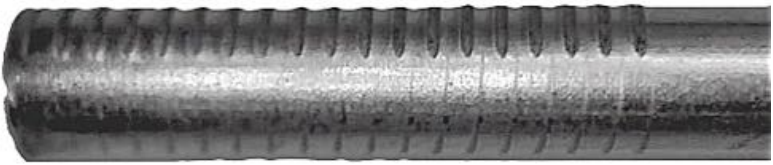


fig 13

Rotating the spoke shows 2 areas where this comparison can be made. The beginning threads look like comets, with blunt heads and thin tails. Without timing precisely set, consistent threading is impossible. Since microscopic tolerances are involved, excess force from a jam might cause good timing to break bad. Spoke wire diameter is also a factor and can vary. A micrometer to check spoke wire will provide important feedback if threading deteriorates.

Adjusting pickup

The spring loaded guide plate (fig. 5, pg 5) carries an adjuster on its bottom edge. This upward-facing thumb screw was added since fig 5 and 6 were drawn. Its function is releasing the spoke to the dies at the correct moment. Wrong moment = non 90 degree angle of entry. If the guide plate pushes too long the spoke will rotate clockwise and become miss threaded.

Gently holding the spoke with your left fingers assists this moment. The thumbscrew allows fine adjustment of the pickup.

Getting this adjustment right enables the machine to pickup at the correct angle, never jam, and not miss thread.

The machine offers excellent guidance for spoke entry. Every time the angle is nearly 90, the threading is smooth and uniform.

Spokes that are not straight (especially aero) are more difficult to align. Work rate needs to slow and a guiding left hand needed.

Straight gauge are particularly easy. The threading rate can be quite high and jams rare.

To fine adjust pickup, tighten the thumbscrew (controlling the start angle of the guide plate) enough that the machine will not pick up the spoke. Then slowly loosen the screw (raising the guide plate angle) until you reach the lowest angle that works.

Why? After spoke insertion but before any thread lever movement, the spoke sits cleanly in the guide block groove, retained by the guide plate. Consider letting the guide plate snap up against the spoke after each insertion. The snap better guarantees the spoke is fully in the groove.

As you begin threading, the guide block rises with the moving die. It rises faster than the spoke. Soon, the spoke doesn't feel the guide groove above it but still feels pressure from the spring loaded guide plate. This pressure can cause a tilt. If the spoke elbow rises faster than the thread end, the angle is off and threading fails. A gentle hand around the extended spoke shaft keeps it from rising and the guide plate should not push the spoke any longer than necessary past pickup. The gentle hand also catches the spoke when it's finished.

The threads below (fig 14) will not accept a nipple. The spoke entered the dies at the incorrect angle. You can see the spoke was misaligned in a clockwise direction. This may be a spoke entry problem. Similar wrong-angle threads can result from incorrect timing. Sounds confusing but notice these factors are related and both must correct to produce a perfect thread.

fig 14

Adjust threading depth

The gauge change switch is limited by upper and lower stoppers (M6 set screws) and these are held secured by horizontal set screws with brass blocks. Backing off the upper (14G) stopper reduces its thread depth. Tightening has the reverse effect. Backing off the lower (15G) stopper will deepen the thread and tightening, the opposite.

Fig. 15 shows the set and stopper screw locations. Wire used for 14G spokes, for example, can vary from 1.95 to 2.05mm diameter. At the extremes of diameter, thread depth should be adjusted to minimize jamming and restore smooth movement. To smoothly handle all incoming diameters, an in between adjustment is best. See the chart on pg 9.

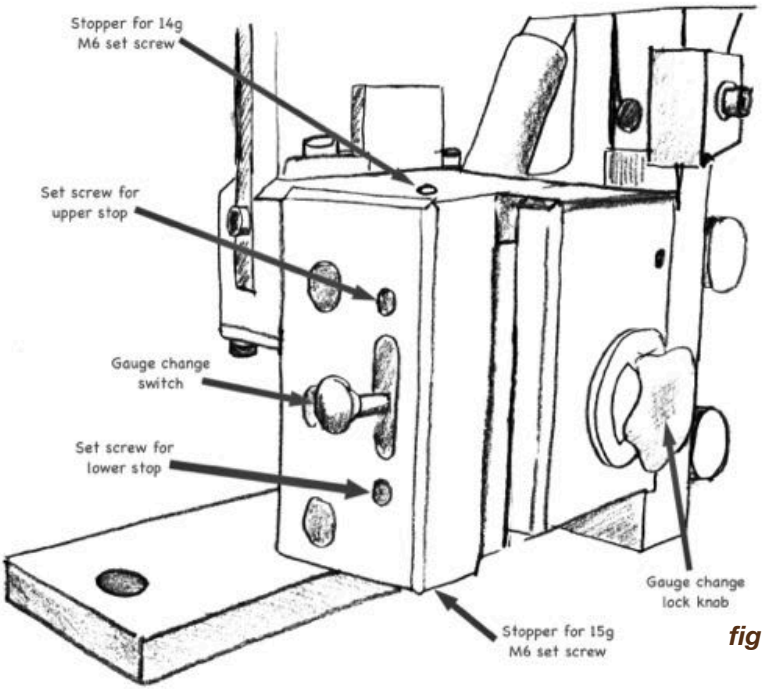


fig 15

Here is a near perfect thread. Notice continuous shape, glossy valleys with generous radius (that, incidentally, increases thread fatigue life over other shapes). We recommend a looser adjustment in which thread peaks are not so sharp. Valleys are still broad, to resist fatigue, and the machine can accept a variety of spoke wire diameters.

fig 16

Spoke thread form is different from other fasteners. Spokes need to resist fatigue cracks that could originate in the thread root. A large radius is best defense. Thread peaks are consequently thin but do not, relatively speaking, carry high load.

With your spoke cutter you can greatly exceed the thread quality of mass producer. Mass production seeks the highest rate that does not yield a deformed thread. As you inspect threads you will learn what standards are used by various makers. Your threads can and should be perfect. Careful hand work trumps high rate production.

Combined with higher length tolerance for cutting, your spokes are better to build with. Mass produced spokes generally hold a length tolerance of a few tenths of a millimeter. With your SCT, the length tolerance can be less than one tenth.

Wheel builds are faster and tension better balanced when spoke length and thread are superior. It is easy to understand why some builders prefer only spokes they have cut and threaded.

Troubleshooting and tips

I. The spoke cannot be fully inserted prior to threading.

1. Check the moving die holder has come all the way to its lower limit.
2. Check the spring loaded guide plate moves smoothly.
3. Inspect for debris that might be blocking the spoke path.

II. The threading lever becomes jammed on the downstroke.

NEVER FORCE THE LEVER. Press the Force Return button and, without releasing it, push the threading lever up and back to its vertical start position. Remove the spoke. Now thread a new spoke.

If the jamming occurs again, remember that a key element of the process is the spoke's exact angle and height of entry into the dies. The spoke guide bracket has a groove on its underside. The spoke must be sit securely in this groove before the threading lever can be pulled down.

Many users find it easiest to depress the lower guide plate with the right hand while the spoke is introduced with the left. When the guide plate is released it

holds the spoke solidly in the feed guide groove. As the thread lever is pulled down, watch the spoke carefully.

A tendency to tip from its horizontal angle must be resisted. The machine is designed to grab the spoke and maintain this angle. But if the spoke, due to shape or straightness, insists on becoming tilted, the threading will fail and the machine jam.

Bladed and butted spokes with short round diameters are especially sensitive. Slow down and apply more guidance to the spoke with your left hand. Gentle guidance can keep the spoke even and enable smooth threading.

Check the thread form with a magnifying glass. Compare to a correctly threaded (factory thread) example. If the thread is too shallow or the thread valleys and peaks are too blunt, the dies may need to be adjusted or replaced.

III. The cutting die does not return.

Debris from cutting can jam the mechanism. Knocking the side of the cutting unit with a block of wood may dislodge the interference. Worst case, disassemble the cutting unit (pg 11) and brush it out.

fig 17

IV. The spoke cut shows a burr.

The moving (shearing) die is not close enough to the round die or is dull. Solution is disassembling the cutting unit and moving the round die up and down until there is light contact but no interference with the moving die. Too much contact and the die will not return when the unit is reassembled. If the round die is notched, it needs grinding or replacement (pg 11).

Some burr (fig 17) is normal as the machine is built with an "oversized" round die so 13 and 12G spokes can be cut without changing.

V. Examining threads.

Keep a good magnifier (fig 18) with the machine. Many clues are revealed in the 10-40X range of inspection. Threads, especially, tell all to someone with experience viewing threads from different situations.

fig 18

VI. Changing thread length.

To adjust spoke thread length, the length bracket can be moved on its slots. Here (fig 19) is the fixed die holder upside down. The length bracket is now on top. Spoke thread length can be adjusted from 9-12mm. If the bracket is removed altogether, the length is 16mm. 13-15 can be arranged by modifying or making a new bracket.

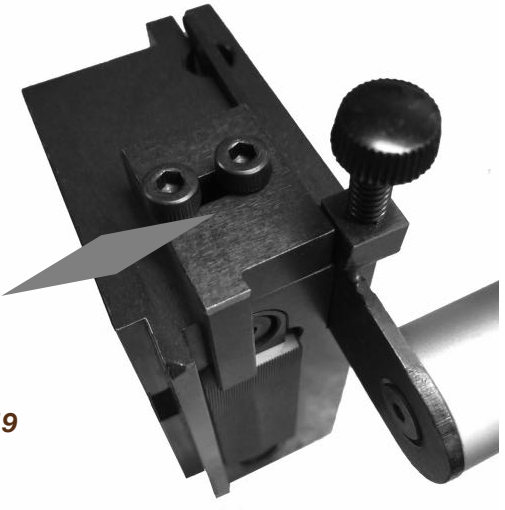
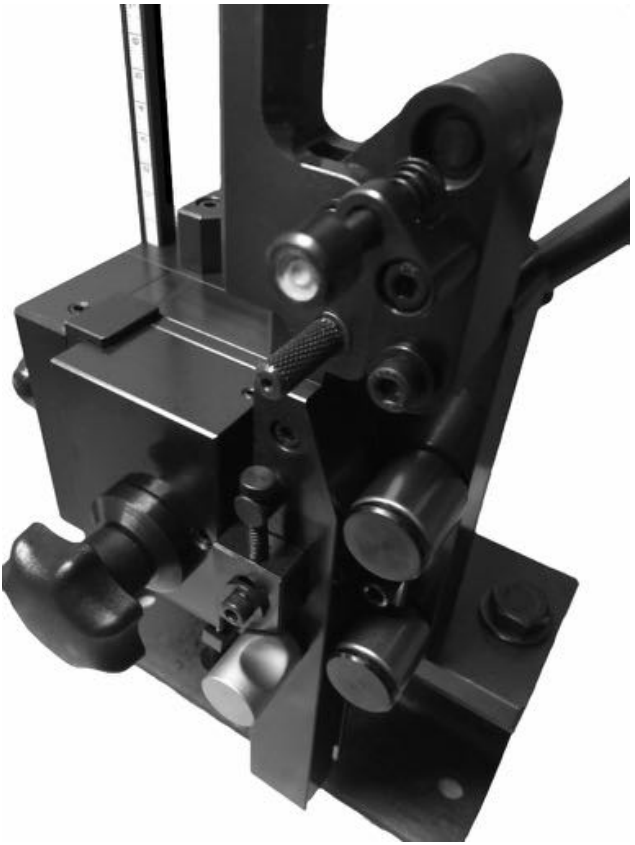


fig 19

VII. Record Keeping.

We recommend you keep a log book near the machine. Note approximate numbers and types of spokes threaded. Try and estimate the volume of use and record the gauges and types of spokes. Establish your cost for threading and begin to anticipate wear and service.



VIII. Look for unexpected spoke variations.

Beware of odd or miss shaped spokes. Blanks that are oval can escape spoke makers because they haven't tried to thread them (it can't be done). A very small amount ofovality might work. A micrometer can help you identify these.

Spoke wire drawn, not CNC'd or extruded. Drawing tolerances are lower so

diameters can vary enough to interfere with threading. Single butted spokes where the thread diameter was swaged down (not drawn) can be oversize.

Double butted spokes listed, for example, as 14-15-14 may not be 1.8 in the swaged center. Measure and experiment before making them into single butted (14-15). This sort of trimming is nice since 15G means the nipple has extra wall thickness.

Butted spokes often have uneven butt lengths. Some (DT) often have gradual transitions that need a careful look before threading. Very thin butted spokes and thin aero spokes (Sapim, for example, Laser and CX-Ray) are often not straight before building. Slow down when threading as the bends can make for uneven pickup and unhelpful gyration during threading.

Painted spokes are fine to thread. Paint is soft and does not interfere except dies need cleaning more often.

IX. Threading lubrication.

Experiment with lubricants. Manual (low speed) flat die thread rolling on wire is a rare corner of metalworking. General advice on threading is often not relevant. Many lubricants work well here. You can judge via lever force. When threading is low effort, you are on the right track. Palm oil, synthetic hypoid gear oil, Phil Tenacious, CLEAR, and others are used regularly.

Several years ago, Tap Magic was recommended. They have a thin, food safe, organic fluid called Formula 2 (in 2019). For us, this seems hard to beat. When spokes are pre-lubed (by sitting in oil prior to threading), use rate is very low. You might try this product, if available.

X. About the guide bearing.

Each SCT has a guide bearing to run against the moving die holder, opposite of the big roller bearings. It is imbedded and can be seen by removing the fixed die holder. In 2015 we switched to an adjustable bearing that is very small. In 2019 we switched to a new design.

Adjustable guide bearing (2015-2018) next to moving die holder.

2019 guide bearing assembly.

It is recommended you change from the adjustable design to the bigger, stronger assembly whenever your machine needs service.

XI. Fastener Torques

No special practice is needed regarding SCT screws and their torque. It's not a vehicle, exposed to significant vibration. You can err on the underside with torque. Here are suggestions for the machine's fasteners, which should always have lubrication on threads and underneath heads.

Thread	Nm	in-lb
M2	1	9
M2.5-M3	2	18
M4	5	44
M5	8	71
M6	10	89
M8	40	354

XII. Looking to the future.

The bicycle world is in continuous transition. The SCT is evolving. The importance of larger gauges is increasing with cargo and e-bikes. Switching gauges is normal for users, not exceptional.

We look for a future machine with improvements. Your suggestions drive our development. Please share ideas and advice. They can be sent to ric@wheelfanatyk.com. All of us look forward to hearing from you.

Warranty

Our warranty is two years against manufacturer's defects from the date of purchase. Eligibility for warranty is determined by Wheel Fanatyk and requires a proof of purchase.

This machine is intended for a very specific purpose. If used outside of that purpose, it will not be warranted and Wheel Fanatyk will not be responsible for any damage that may occur in that circumstance.

If you experience problems, contact Wheel Fanatyk for a prompt resolution. Shipping to and from Wheel Fanatyk is not covered by warranty.

For returns, maintenance, or warranty service; write to info@wheelfanatyk.com:
Wheel Fanatyk
111 Curtis St
Port Hadlock, WA 98339
USA

Mr Morizumi at work - 2009

WHEEL FANATYK

SPOKE CUTTING AND THREADING MACHINE

Port Hadlock, WA