G&S Tire Grinder Setup and Use

Inspired by Dennis Samson, designed and made by Greg Gaub, the G&S Tire Grinder is a new kind of tire truing machine, suitable for most kinds of 1/32 and 1/24 slot car wheels and axles.

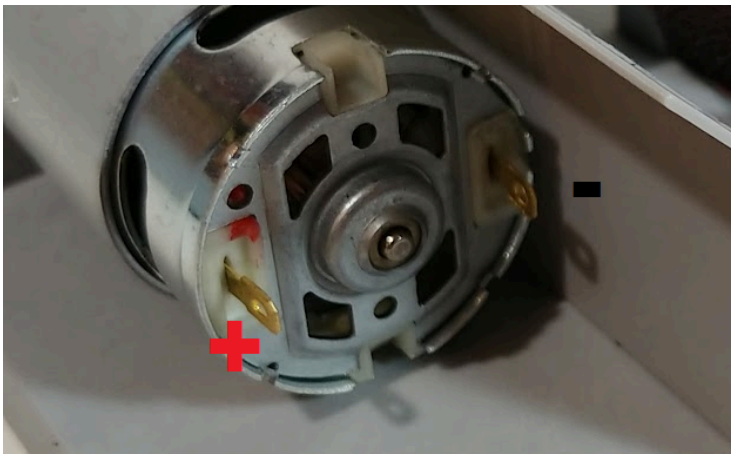
Key Features of the G&S Tire Grinder

- Trues both tires at the same time
- Standard 1/32 bushings snap into axle carrier, and V-shape allows smaller or larger bushings or bearings to stay in place
- One motor turns all axes
- Only four screws to remove/replace the entire sanding spindle for different grits
- Screws beneath the ball bearings to tram the sanding spindle to the axle bracket
- Spring loaded axle carrier to allow "grind and release" truing methods with ease
- Indicator knob for precise repetition of tire diameters as needed
- Consistent tension of o-rings due to idler pulley design
- O-rings can easily be moved side to side to accommodate various axle configurations
- Distance between sanding drums accommodates most 1/24 and 1/32 wheels/axles
- Sanding surface cannot contact axle pulley or o-ring

Chapters:

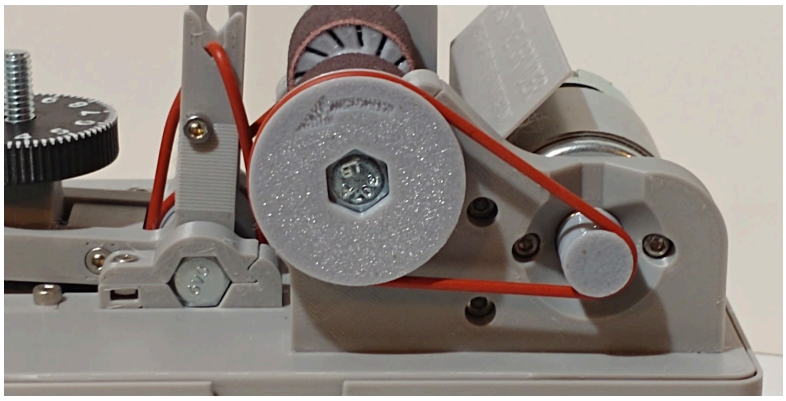
Power Supplies

An adjustable DC power supply with 0-12V and at least 5A output is recommended. For example, in the photo below on the left is a 0-30v 0-10A adjustable bench power supply, with digital display for both Amps and Volts, typically available for around $60 USD. On the right is a 3-12V 5A adjustable power supply with a digital display for Volts that usually costs about $20. Amperage display can be helpful, but not required. Power supplies with lower Amp output may work, but not lower than 3A.



When connecting the output of the power supply to the G&S Tire Grinder motor, the positive lead should be connected to the left terminal of the motor (when viewed as shown in the photo), and the negative/ground should be connected to the right terminal. The terminals are 3mm, and can be soldered to, clipped to with alligator clips, or connected using 3mm, 5/32”, or 3/16” female spade connectors.

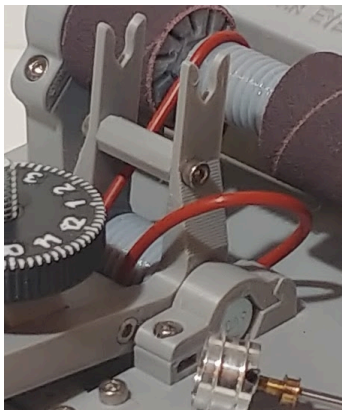
The motor should rotate counterclockwise when viewed from the right side as shown. Most machines have an arrow indicator on the large pulley on the sanding spindle to help confirm correct direction of rotation. If your machine does not rotate the correct direction, reverse the polarity of power to the motor by swapping the wires either at the motor, or at the power supply.



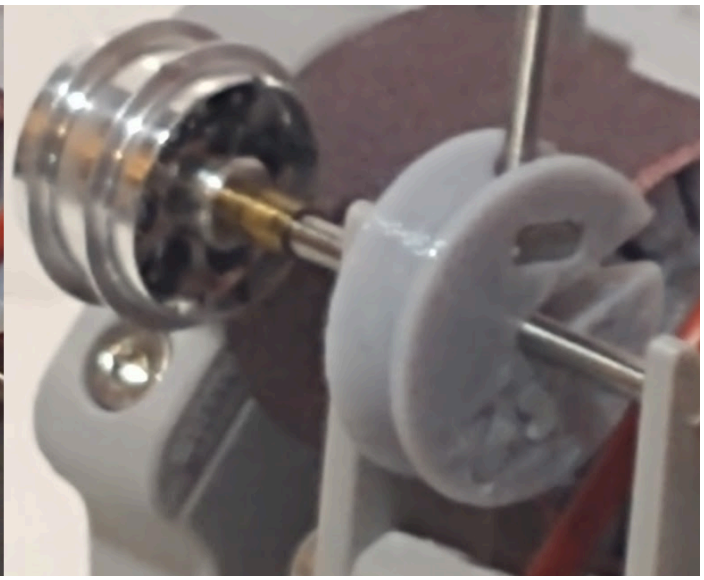
Tramming

Tramming means to adjust for precision. We want to ensure that the sanding spindle is as precisely parallel to the axle carrier/bracket as possible. The sanding spindle spins within two R188 ball bearings, behind which there are screws placed such that backing out the screw will move that end of the sanding spindle closer to that side of the axle bracket. Through a process of test and check, we can achieve parallelism between the two axes. This is best done using metal wheels without tires, but can be done with plastic wheels and/or with tires. If using plastic wheels, or if tires are left in place, additional tramming may be desired later.

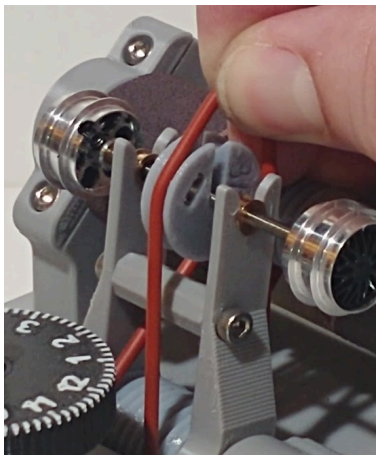
Step 1 - Stretch and move the rubber band over one side of the axle bracket so that it is off of the bracket completely. After removing an axle with wheels and bushings from a car (or putting one together from spare parts), install the axle by aligning the bushings with the forks on the axle bracket and press the bushings into the forks so that they snap into place.

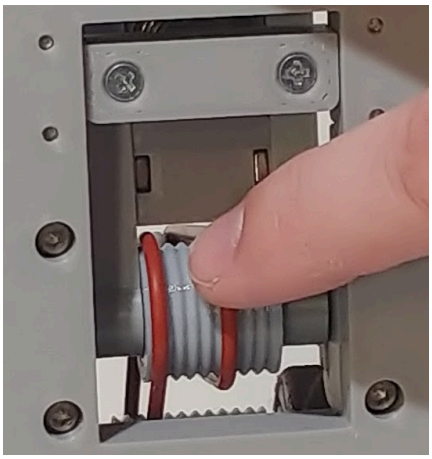


Step 2 - Install the appropriate split pulley as near to the center of the axle as possible. A set screw is provided, or already installed, requiring a 1.5mm hex driver to adjust. Snug down the set screw.

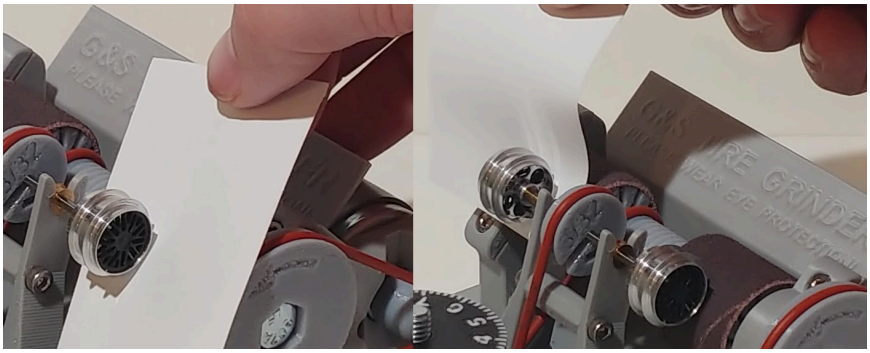
Step 3 - Pull the rubber band over the wheel and bracket and onto the split pulley. Through the opening on the base of the machine, you can roll the band to either side so that the wheels are centered on the axle bracket.





Step 4 - Turn the indicator knob counterclockwise so that the wheels move closer to the sanding spindle drums. Keep turning until one wheel is just touching the sanding drum, then turn the knob clockwise a small amount so that there is a thin space between the wheels/tires and the sanding drums.

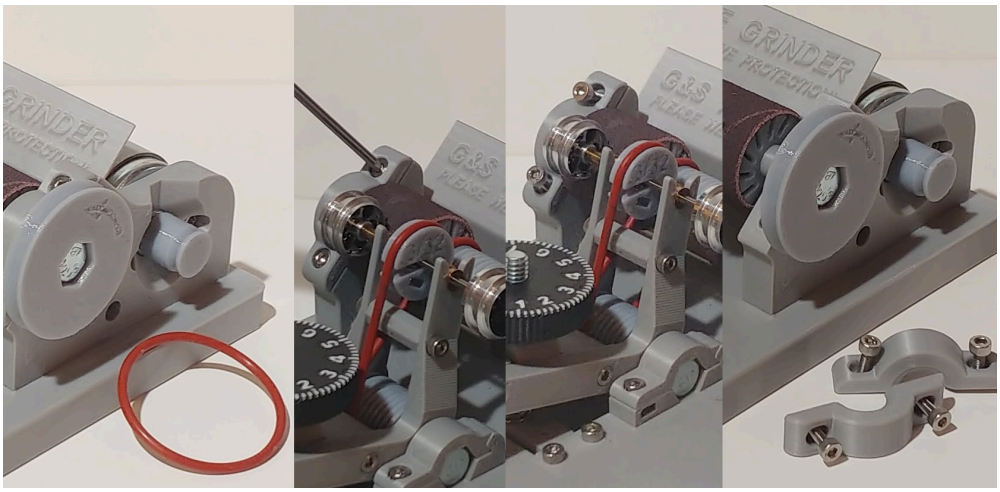
Step 5 - Using a piece of paper, such as regular printer paper or a post-it note, slide the paper between the wheel and the sanding drum on both sides. If the paper slips freely between them on both sides, turn the knob back slightly until the paper can still move, but you can feel friction. The paper should not be trapped by the wheel and sanding drum, but there should be a slight resistance to pulling it, while still being able to push the paper through the gap.



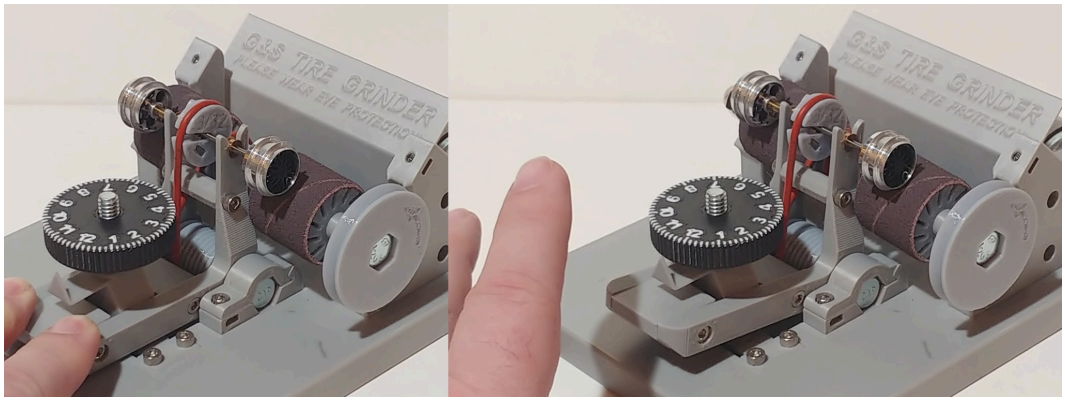
Now, test the other side. If either side is harder, or easier, to slide the paper between the wheel and sanding drum, then the sanding spindle is not parallel to the axle bracket, and one side will need to be adjusted. If both sides have the same feeling of resistance to moving the paper in and out, then the sanding spindle is already trammed, and you can skip to truing your first set of tires!

Step 6 - Still using a piece of paper, adjust the axle bracket so that one side has friction, but the other side allows the paper to slip freely between the wheel and sanding drum. Rotate the sanding spindle in each direction to confirm that the difference is consistent, and not just a particularly tall bit of abrasive on the sanding drum. The side that allows the paper to slip freely is the side that needs to be adjusted. Leave the indicator knob at this setting.

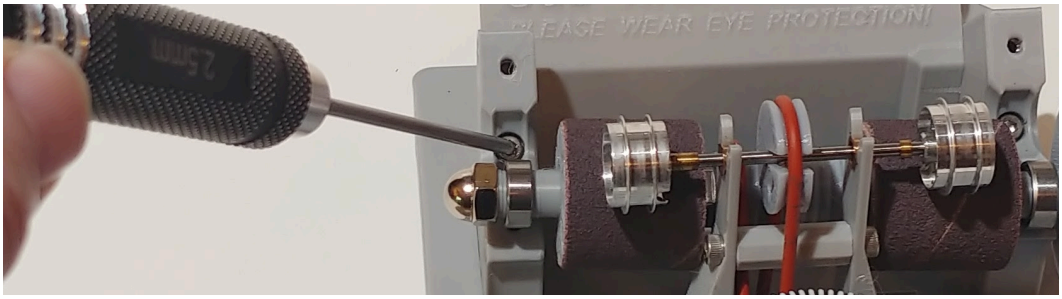
Step 7 - Remove the rubber band from the motor and sanding spindle pulley, then remove the two screws from the sanding spindle clamps at each end, using a 2.5mm hex driver. Once the screws are removed, set the clamps and screws aside.



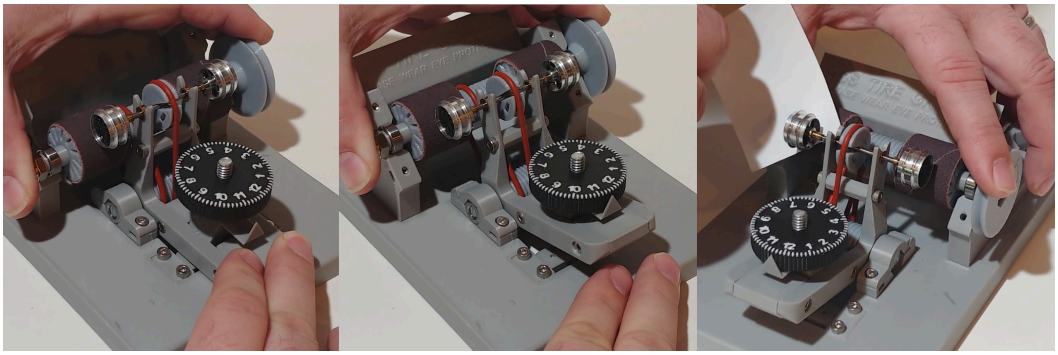
Step 8 - Press down on the center of the paddle in front of the indicator knob, compressing the spring. This will help you lift the sanding spindle out of its supports so that you have access to the tramming screws, one in the center of each support, below where the roller bearings rest. You should be able to release the axle bracket with the sanding spindle pinned between it and the spindle supports.



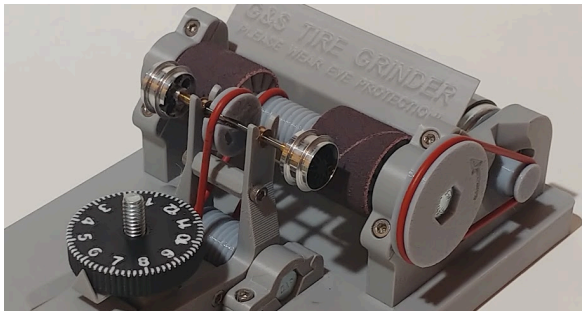
Step 9 - Using your 2.5mm hex driver, unscrew (back out) the tramming screw (m3x6mm socket head cap screw) on the side that the paper was able to slide freely. The goal is to raise that bearing just enough for that side to have the same amount of friction on the paper as the other side. Since the screws are normally not touching the bearing at all, start by unscrewing it by 1.5 full counterclockwise rotations. Use a reference point on your driver to confirm how much you are turning it.



Step 10 - Press and release pressure on the axle bracket while replacing the sanding spindle and hold it firmly in place on the supports while testing both sides with the piece of paper again. You should only need to test the side you are adjusting, but it is also a good idea to test both sides before determining that tramming is complete. Repeat steps 8-10 with small adjustments to the tramming screw until both sides have the same amount of friction for the paper.



Finish - Replace the sanding spindle clamps and the four screws. It is best to start all four screws, making sure not to cross-thread any of them, screwing them in evenly until you feel resistance. Do not screw them down hard, especially on the side that required adjustment. Doing so may distort the bearing and cause problems using the machine, and excess wear on the bearing. Check the tramming one more time with the paper before proceeding.

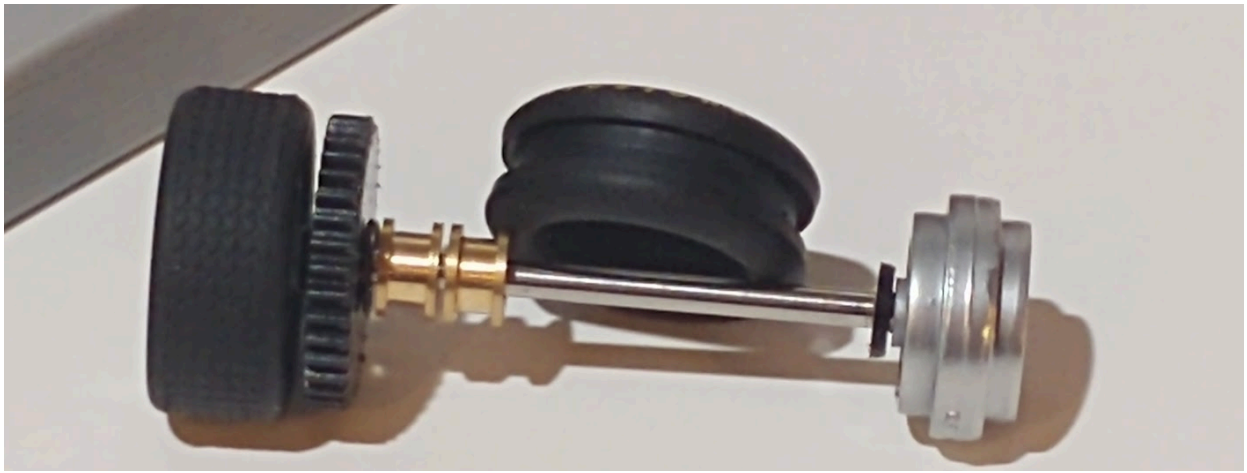


Truing Tires

The following methods are personal preference. You may find that advice provided by other racers differs from what is written below, or that you discover a process that you like better. All of that is A-OK! If this is your first time truing any kind of slot car tires, then this guide is a good place to start. If you've done tires before, then you probably already know what needs to be done and how this machine works.

Note that different tire types require different methods to ensure a good quality result. For example, silicone tires are particularly difficult to true because they are so hard wearing. If you need to true silicone tires, then you might get better results by replacing the standard sanding sleeves with something that has some kind of diamond abrasive. On the other hand, urethane tires tend to be very easy to true, and don't require nearly as much care and patience as some rubber tires do. The process below is a good starting point for most rubber tire compounds, such as NSR, Thunderslot, ScaleAuto, Slot.it, and more, where the softness can mean they have a tendency to overheat and degrade, becoming gummy/sticky, or ball up.

Step 1 - If you're truing tires on metal wheels, you can skip this step. For plastic wheels, it's a good idea to remove the tires and examine the wheel itself. In some cases, there is flashing from the injection molding process, or other bumps and imperfections that will prevent the tire from seating correctly on the wheel. Use your eyes and fingers to look and feel for such imperfections, and use a cutting tool and/or sanding tool to remove as many as you can. Some people will even use their tire truing machine to sand the wheel.

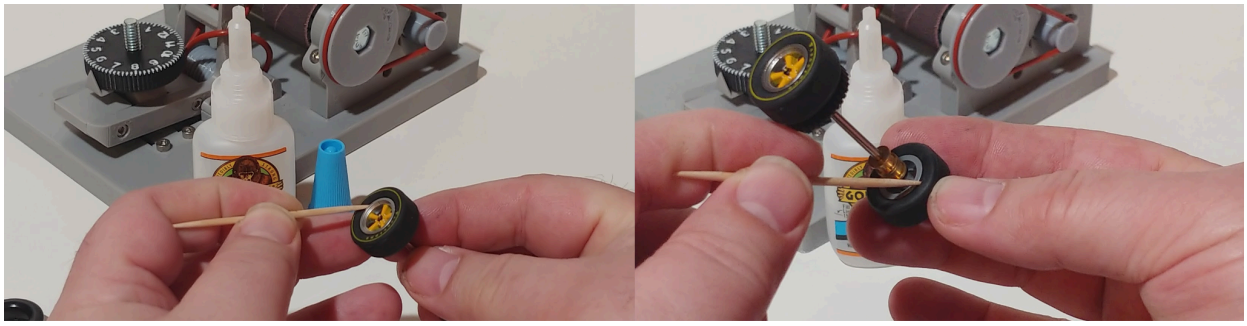


Step 2 - Tires can also have imperfections from the molding process, not only on the outside, but also on the inside. Examine the tire thoroughly and clip off any obvious bits of flashing or imperfections. In some cases, it's helpful to turn the tire completely inside out to clean those surfaces.

Step 3 - Degrease the wheel and the inside edges/surfaces of the tire. Wherever the tire and wheel will be touching, it's best to make sure those surfaces are free of any grease or oil, such as from your skin. Isopropyl Alcohol (not "rubbing alcohol") is a good degreasing agent, and will also be useful in the tire truing process. Use a cotton swab and/or some paper towel to clean those surfaces before gluing.

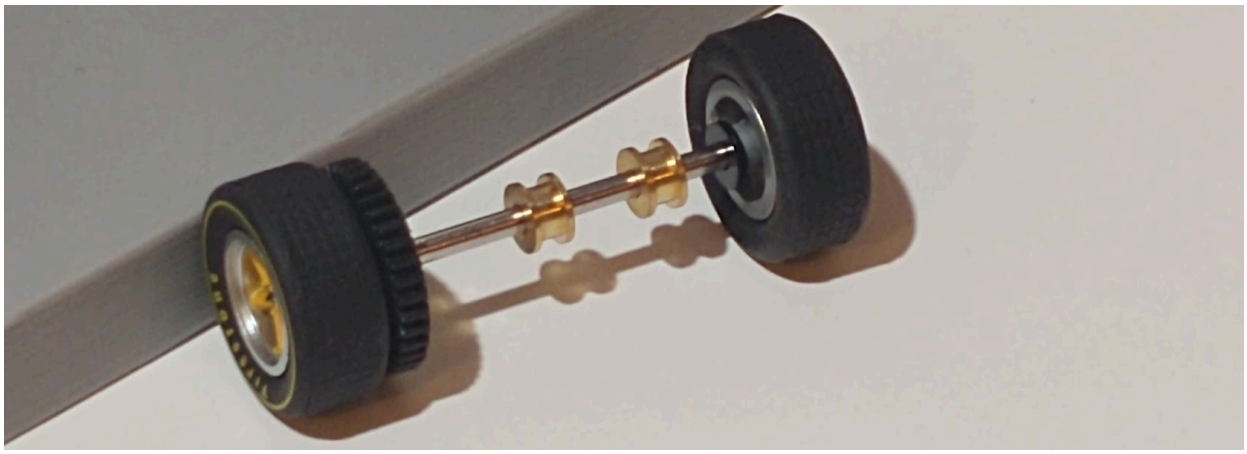
Step 4 - Glue the tires to the wheels. This can be tricky, so it can help to have glue that does not bond too quickly like common super-glue (cyanoacrylate) tends to. A popular product that many slot racers prefer is Gorilla brand super glue, easily identified by the blue colored cap on the bottle. It is thick and does not cure instantly, providing good working time for the process.

Common practice is to use a toothpick with a single drop of superglue on the end, inserted between the tire and the rim of the wheel, run around the rim a few times in each direction to ensure the glue is spread evenly around the rim. Do this on both the inner and outer rims of each wheel. If possible, spin the wheel in the tire while holding the tire in place to help spread the glue even more. The more even the glue, the better the truing results.



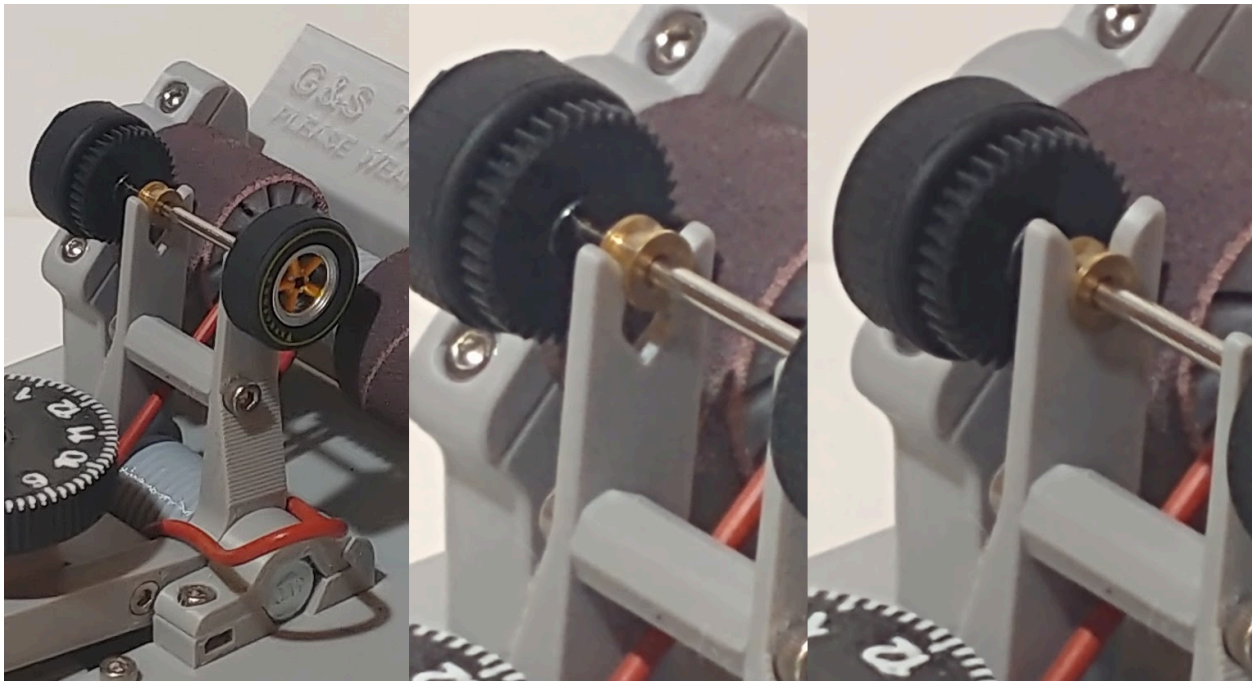
Because this glue can take time to cure, be sure to give it that time before proceeding. Other alternatives include nail polish, two part super glue that cures when a curing agent is applied, or glue that cures when UV light is applied to it. Experiment with different options and choose what works best for you. Before proceeding to true the tires, test the adhesion of the tire to the wheel by lightly pulling up the edge. It should remain firmly attached. If it peels up easily, then it won't last on the machine, let alone the track.

Step 5 - With the tires securely glued to the wheels, make sure your axle has standard 3/32 double flanged bushings on it (e.g. NSR4803 or SIPA02) or whatever works for your axle and is not much larger than 4.8mm diameter between the flanges. Axles removed from cars made by Scalextric, Carrera, Pioneer, SCX, NINCO, Fly, and many others that just pop out of brackets on the chassis should fit just fine.



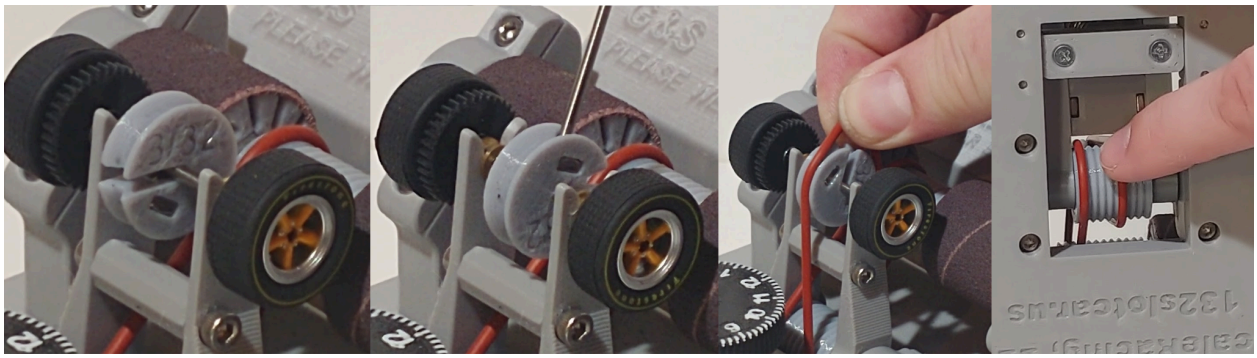
Move the rubber band to one side of the axle bracket, over the fork and off to the side. Line the bushings up with the forks on the axle bracket, and press them down into the sockets. You should not need to apply a lot of pressure to pop them in.

If the bushings are not of the correct size, then just allow them to rest at the bottom of the V shape in the fork, either above or below the sockets. This will be common for for 1/24 wheels and axles, though it is possible to find double flanged bushings that fit larger axles and are still the correct diameter.

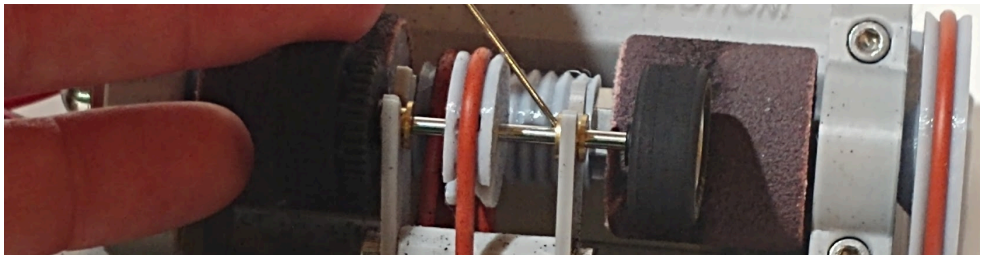


Step 6 - Install the appropriate split pulley (3/32” and 3mm options are provided with pre-installed nuts and set screws) as close to the center of the axle as possible. If there is a gear in the center of the axle already, just put the split pulley to whichever side seems to work best. Use a 1.5mm hex driver to tighten the set screw to the axle, securing the pulley.

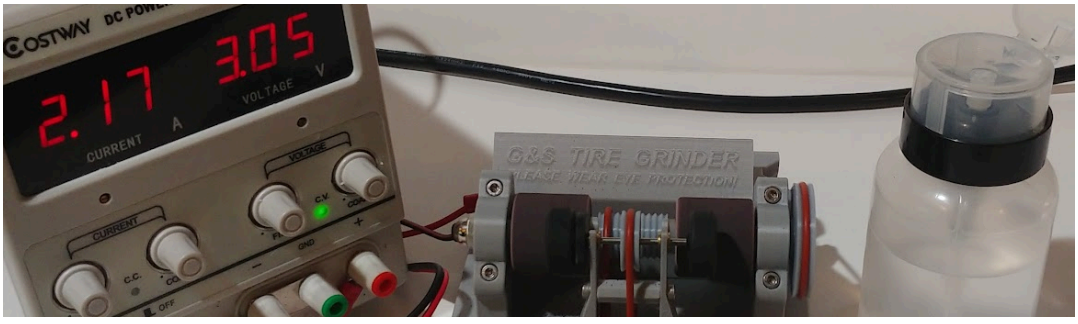
Stretch the rubber band up and over the wheel and axle bracket, and onto the split pulley. If the wheels are not centered on the axle bracket, the rubber band can be easily rolled to either side as needed, using the opening on the bottom of the tire grinder’s base plate. The rubber band between the idler pulley and the sanding spindle can also be rolled to either side as needed, so that it does not interfere with the axle drive band.



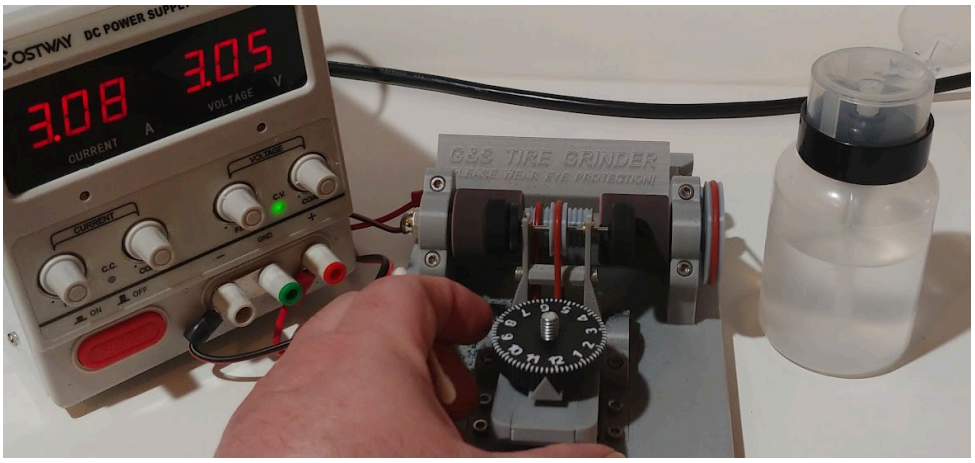
Before continuing, it’s best to lubricate the bushings or bearings. Use your favorite light oil, such as 3-in-1, INOX MX3, or any number of similar products, whether they’re marketed to slot car racers, or RC racers, or whatever. A single drop for each bushing should be plenty. You can manually turn the axle, or turn on the machine at a low speed/voltage to help the lubricant wick into the space between the axle and bushing.



Step 7 - Make sure the tires are NOT touching the sanding drums, and then turn on your power supply unit (PSU), setting the voltage to approximately 3V, no more than 4V. If your PSU has an amperage display, take note of the value while the machine is running without the tires touching the sanding drums. Otherwise, pay attention to the pitch of the motor as it’s spinning.



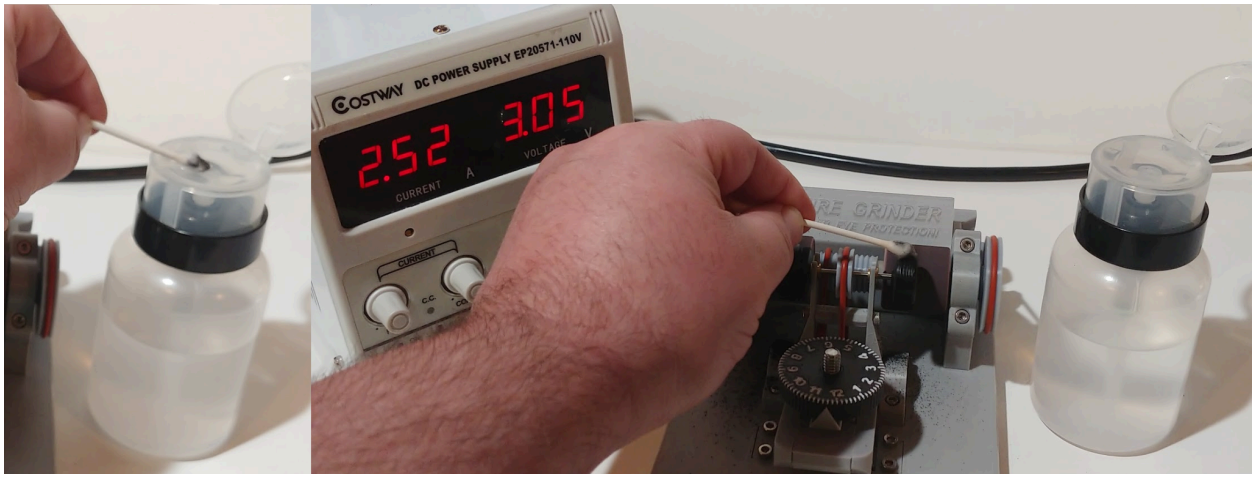
The pitch will go down, while the amperage will go up, as soon as the tires contact the sanding drums. Do NOT apply excessive pressure to the sanding drums with the tires. Doing so will cause the machine to stall, or the axle to skip or stutter, which can damage the tires or the machine. Slow and steady is best.



So begins the process of applying pressure and relieving it to prevent the tires from overheating. Some users prefer to turn the indicator knob back and forth to apply and relieve pressure. Some users prefer to press down on the paddle in front of the indicator to relieve pressure. Some users prefer to apply a cooling/lubricating agent, such as water or isopropyl alcohol to the tires as they are spinning. Use whatever method you find most convenient and effective, but be cautious and patient, checking the tires regularly with the motor stopped, to avoid overheating the rubber and damaging the tires, making them sticky or balling up. The following steps are for the coolant/lubrication method.

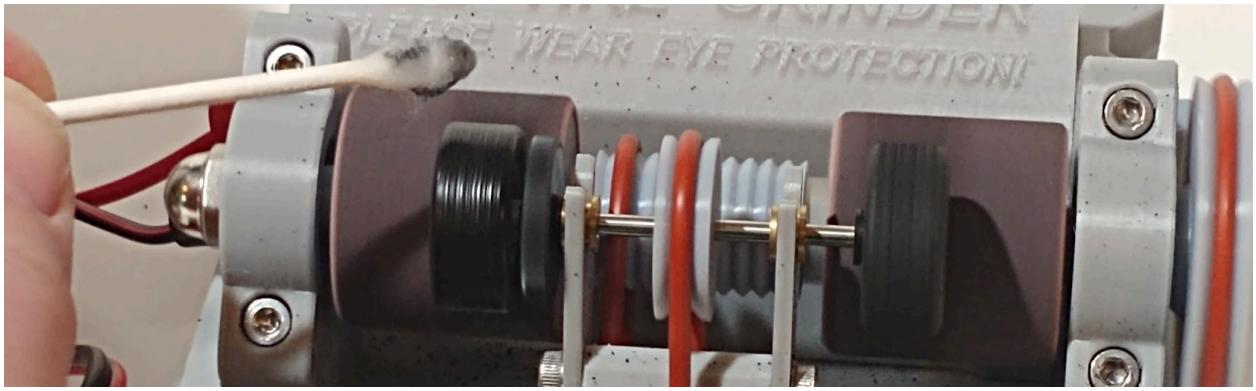
Remember the pitch of the motor, or the amp draw of the PSU, while the wheels were not touching, and how those things change when applying pressure? We want to watch and listen for those things again while we apply our chosen cooling/lubricating agent to the tires while they are being “cut” by the sanding drums. Some people use water, but isopropyl alcohol (IPA) is becoming more common because of how quickly it evaporates, which is what performs the cooling. Before it completely evaporates, it is also providing a lubrication effect, helping the tire to cool down.

Step 8 - With a small absorbent applicator, such as a cotton swab (Q-tip), and a convenient dish (such as the bottle cap) to hold the IPA, dip the swab into the IPA and apply it immediately to both tires. You should hear the motor pitch go up as the motor speeds up due to the lubrication effect of the IPA. If your PSU shows amp draw, you should see that number go back down again.

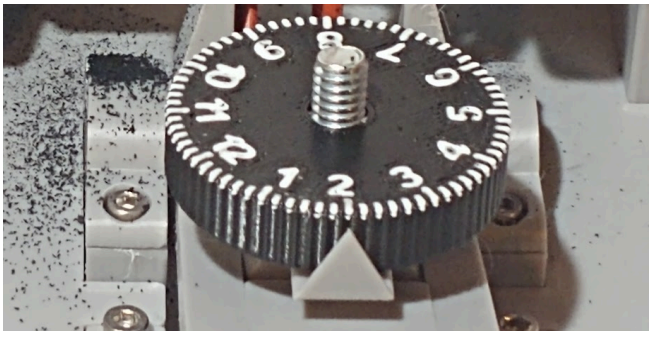


It may not go down as low as when there is no pressure on the sanding drum, but it will go down significantly. For example, it may use around 2A while running free, but close to 3A when tires are applied to the sanding drum, and somewhere between the two after the IPA has been freshly applied. If your amp draw exceeds 4A, it's likely that you are applying too much pressure for rubber tires, and should back it off a little so that there is still pressure and higher amp draw, but not that much. Try to keep it around 3A while the tires are being cut (no IPA).

Step 9 - Listen to the pitch of the motor, watch the amp draw on your PSU, and look at the tires themselves. While the IPA is still working, the tires will appear shiny and wet. Once the IPA is gone, the tires will look dry again, and the pitch will drop and amp draw rise. At that point, the machine is cutting the tires. Allow that state for a couple seconds, not more than a few, then re-apply the IPA to the tires.



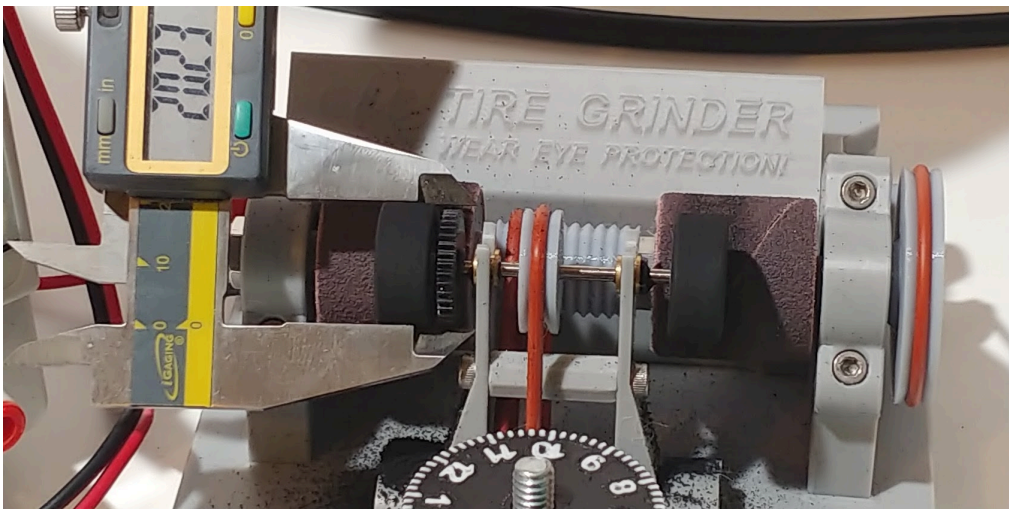
Step 10 - Without changing the position of the indicator knob, repeat step 9 as often as necessary until there is very little difference between the pitch and amp draw when the tire is wet with IPA and when the tire is dry. At that point, turn off the machine and check the tires for progress. Note the current position of the indicator knob, which might come in handy later.



If the above steps were followed, the tires should not be gummy/sticky or balling up. Examine both tires to see how much more work there is to be done. For most people, the end goal is that both tires have been sanded evenly all the way across the tire, and all the way around the circumference of the tire. If neither tire is done, then repeat steps 9 and 10 while adjusting the indicator knob a little at a time.

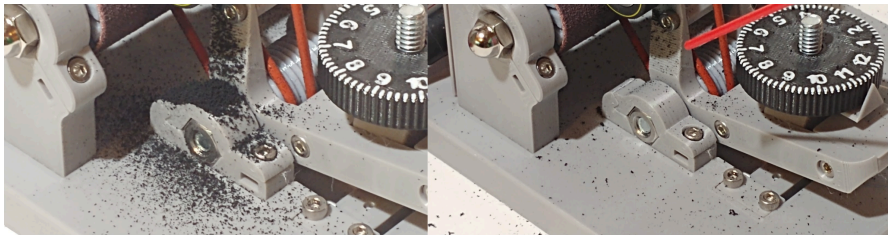
Even with a perfectly parallel sanding spindle to axle bracket, it's not uncommon for one tire to be "done" while the other still needs work. Tire diameter can often be different enough for one to need more work to get to the target trueness. If one tire is done, and the other tire has barely been sanded at all, then you'll probably want to refer back to the chapter on Tramming to adjust the sanding spindle again (or refer to the Alternate Ending below).

Use some digital calipers to measure both tires, making sure not to apply too much pressure, and to take multiple measurements around the tire to ensure consistency. If one tire is significantly smaller than the other, e.g. 0.2mm or more, then tramming may need work again.

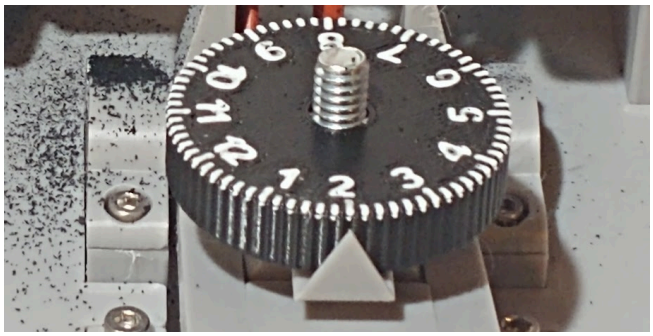


If the difference in diameter is negligible, e.g. under 0.1mm difference, but with one tire needing more work, or your goal is to get the tire to a specific outside diameter for competition, then continue with repeating steps 10 and 11 while adjusting the indicator knob a little bit at a time until both tires are evenly sanded all the way across and all the way around and are both of the same target diameter.

When you're done, it's pretty likely that your machine will be dirty with tire dust. Be sure to prevent it from collecting and causing problems with bearings and other parts of the machine's mechanisms by cleaning off all the dust. Use a vacuum and/or a few blasts of air to dislodge and clean off as much tire dust as you can. A few specs is not a problem, but the cleaner, the better.



Alternate Ending - If you've gotten one tire done, but the other is not done and is a measurably larger diameter, and you don't want to mess around with tramming any more, this is where the indicator knob comes into play. Remember the nearest number and notch at the arrow when your first tire was done? The plan is to get the other tire to the same notch.

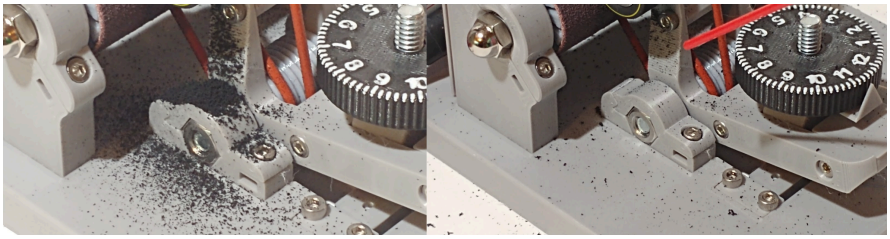


Remove the rubber band from the pulley off to one side, then remove the whole axle and turn it 180 so that the tires are now on opposite sides. The larger tire should now be where the smaller tire was. Re-install the axle to the bracket as before, and re-install the rubber band to the pulley.

Turn the machine on, and turn the knob until the undone tire hits the sanding drum. If you compare the position of the indicator knob at this point, it should be different from the point it was at when the first tire was done.

Repeat steps 10 and 11 above until the indicator knob is in the same position as from before. At this point, that tire should also be trued all the way across and around, and of the same diameter as the other one. If not, then it's possible this tire needs to go a little smaller. In that case, note the position of the indicator knob when that tire is done, swap around the axle, and repeat that process one more time to sand the first tire down to the same diameter. It should not be necessary to turn it around a third time.

Be sure to clean the machine with a vacuum and/or some pressurized air blasts before putting it away, or beginning another set of wheels and tires.

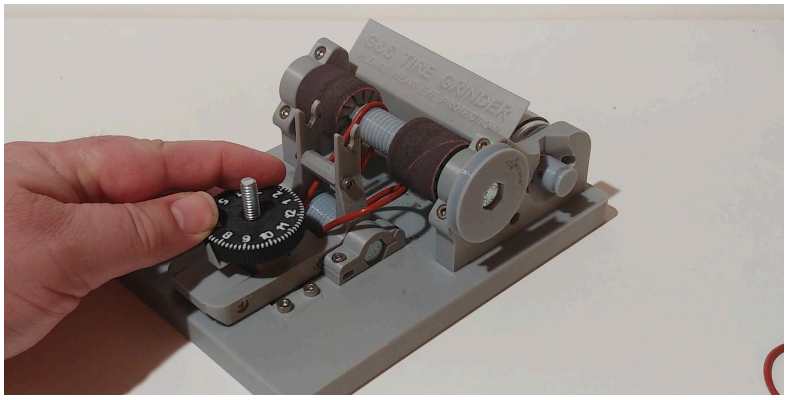


Now is also a good time to apply any treatments to the rubber. For example, NSR recommends their tire oil to be applied after racing due to tire wear, and this process certainly did some wear! Whatever your tires need to remain in good condition, do that now, so that they are ready for the next race.

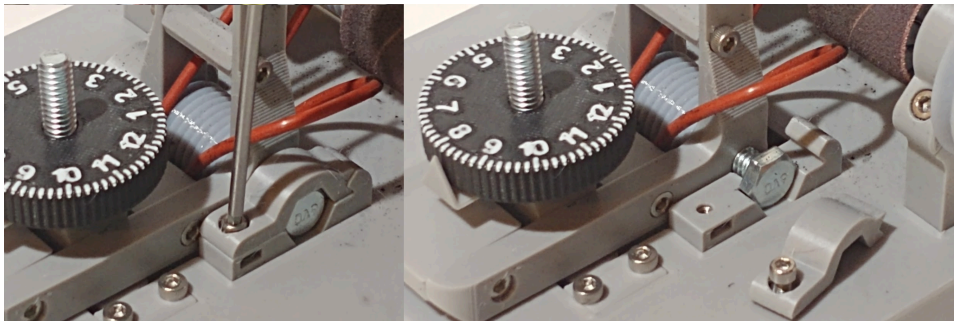
Replacing Rubber Bands

The provided bands should be fairly durable, and a spare is included in case of breakage, but they won't last forever. You should be able to order more bands from where you got your machine, but if they are ever unavailable, and you need more, search your favorite retailer for #128 o-rings. The primary drive band is pretty simple to replace, but the other two do require some partial disassembly of the machine.

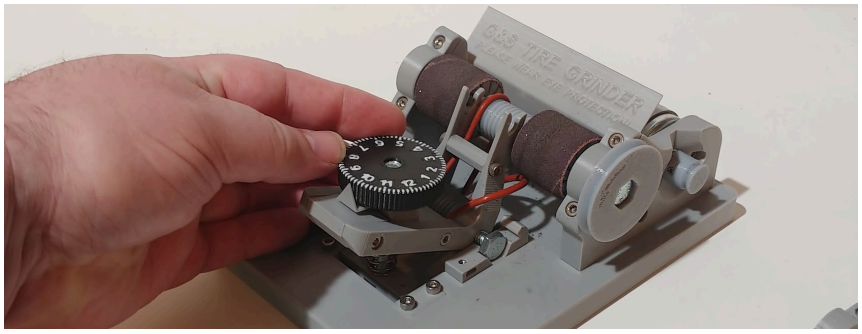
Step 1 - Turn the indicator knob clockwise to tighten it most, if not all, of the way down. Doing this helps prevent parts from popping off while others are being removed.



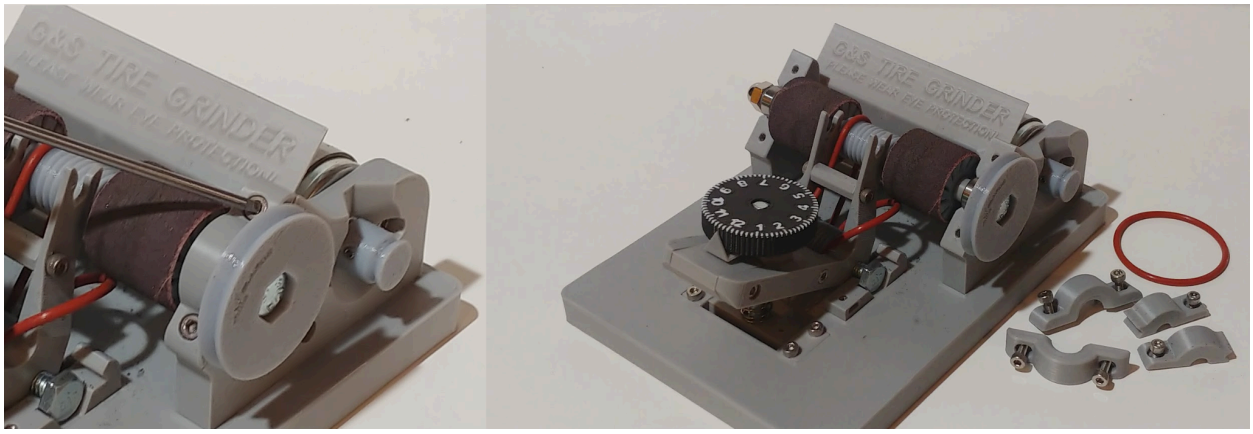
Step 2 - Using your 2.5mm hex driver, remove the screw from the axle bracket pivot clamp on both sides of the axle bracket assembly. Set the screws and clamps aside.



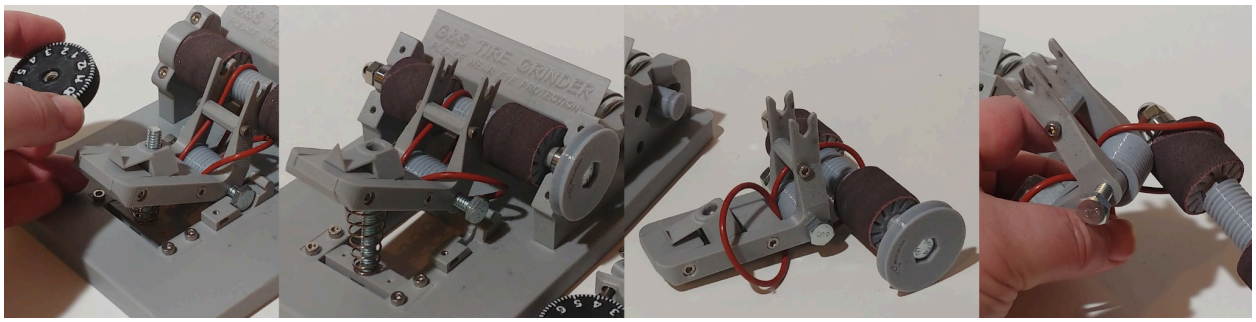
Step 3 - Turn the indicator knob counterclockwise to raise it up, allowing the axle bracket pivot bolt to lift up out of the clamps so that the entire axle bracket moves toward the sanding spindle until the rubber band between the two (if it hasn't broken) is loose.



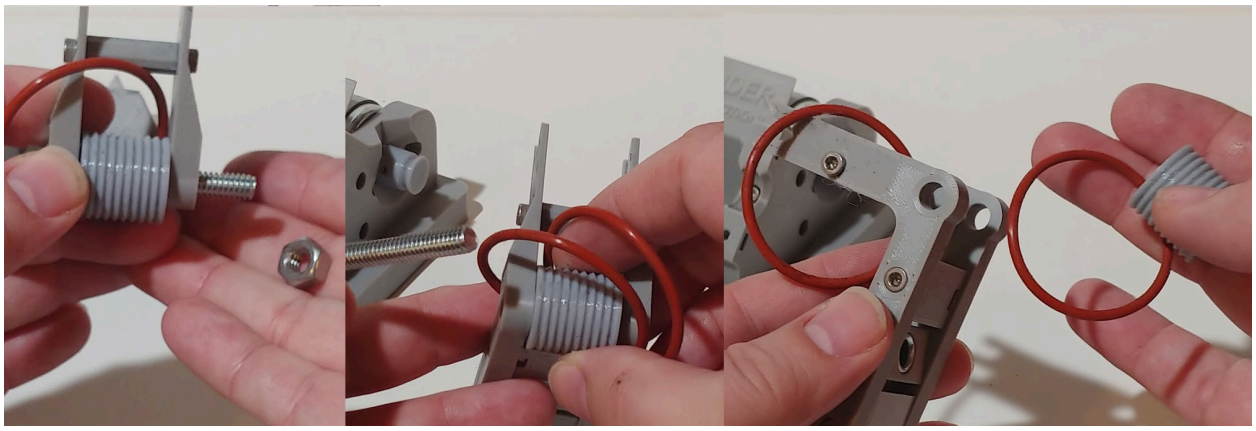
Step 4 - Remove both screws from the clamps at both ends of the sanding spindle. Set the screws and clamps aside.



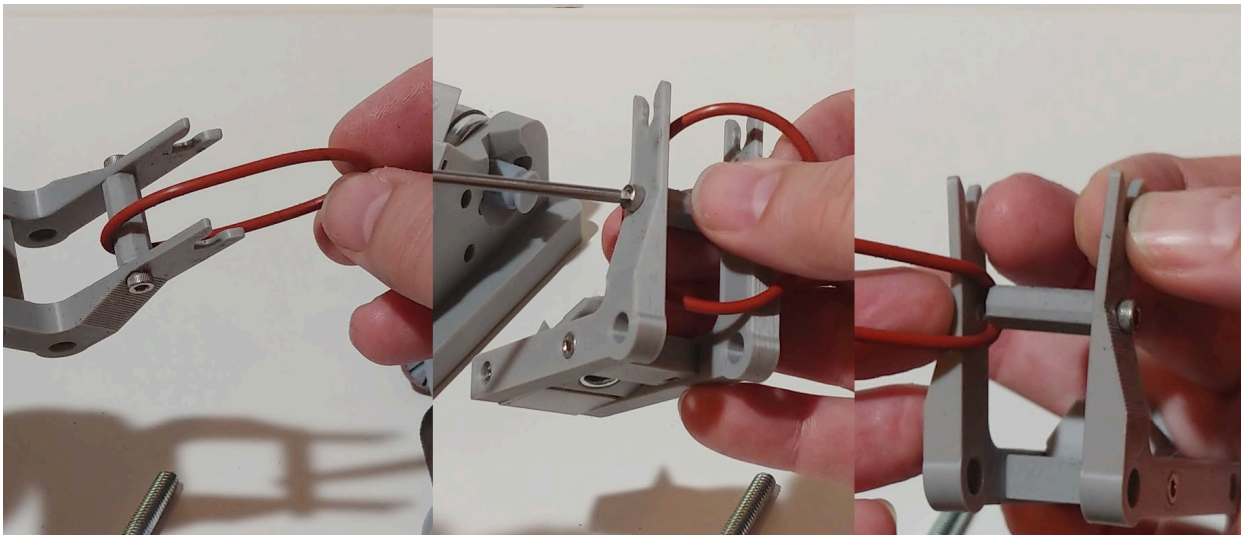
Step 5 - Unscrew the indicator knob completely, removing it, so that both the axle bracket assembly and sanding spindle can be removed from the base. If the sanding spindle band is still in one piece, the spindle can now be easily removed from it.



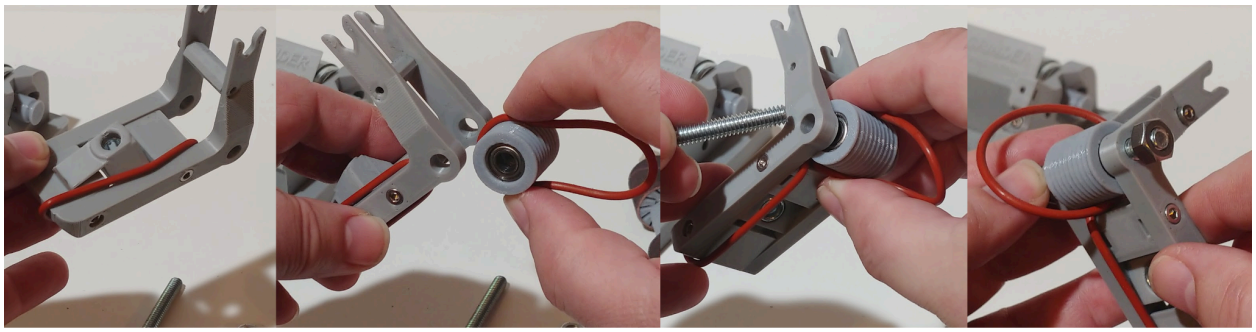
Step 6 - Remove the nut from the end of the axle bracket pivot bolt, then remove the bolt so that the idler pulley can come out from between the axle bracket sides. If you only need to replace the band between the idler pulley and sanding spindle, you can skip to step **8**.



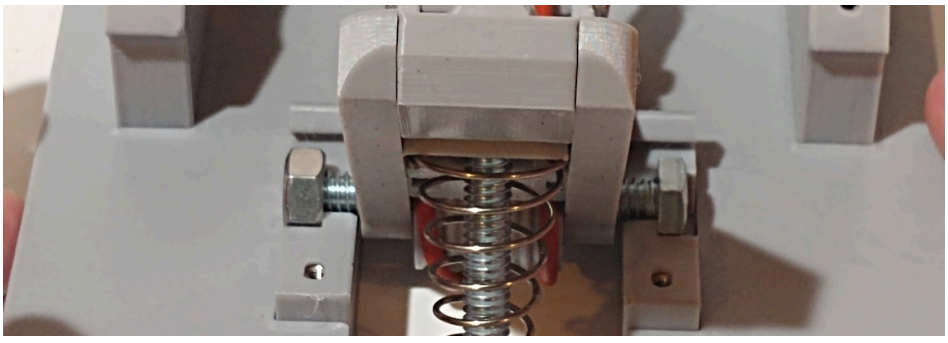
Step 7 - If you need to replace the axle drive band, then you have another screw to remove. Use your 2.5mm hex driver to remove one of the screws from one side of the axle bracket, up near the forks, to release the stabilizing bar on one side. You can then gently pry that side of the axle bracket away from the stabilizing bar enough to slip the band between them, replace the band the same way, then replace the screw.



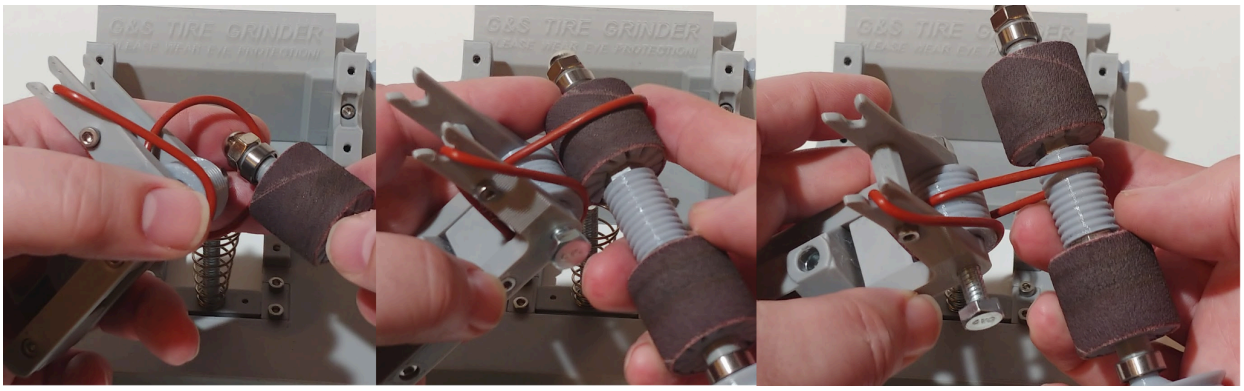
Step 8 - Move the axle drive band out of the way by looping it around the paddle end of the axle bracket. Reinstall the idler pulley with the other replacement band around it, holding it in place while reinstalling the pivot bolt and nut. Leave the nut near the end of the bolt.



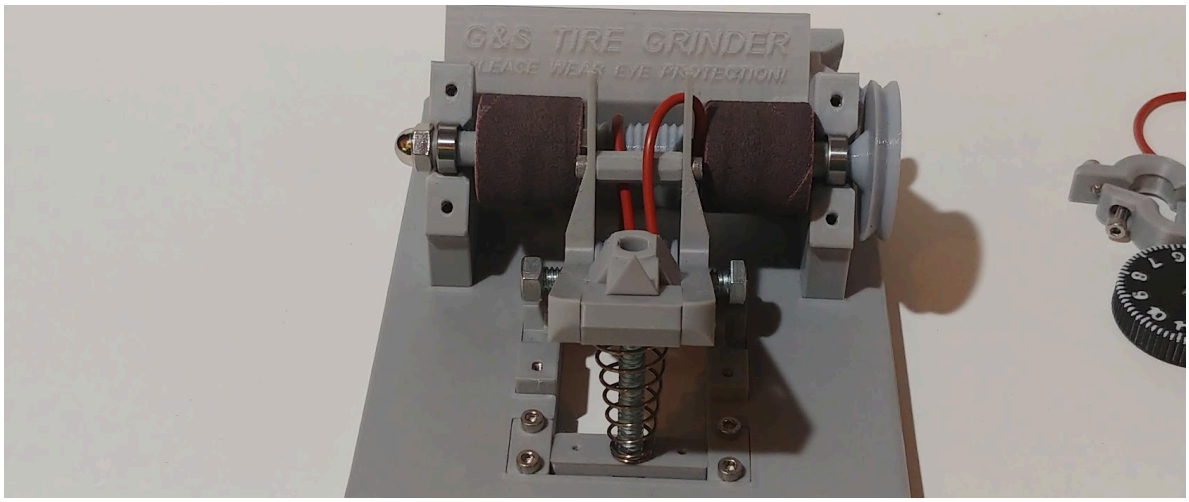
Step 9 - Test fit the axle bracket into the clamps. You will probably need to adjust the nut in or out a little bit for a good fit. It should be snug and not loose, but a little loose is OK. Don't clamp it in just yet, though! Take it back out of the base to refit the sanding spindle.



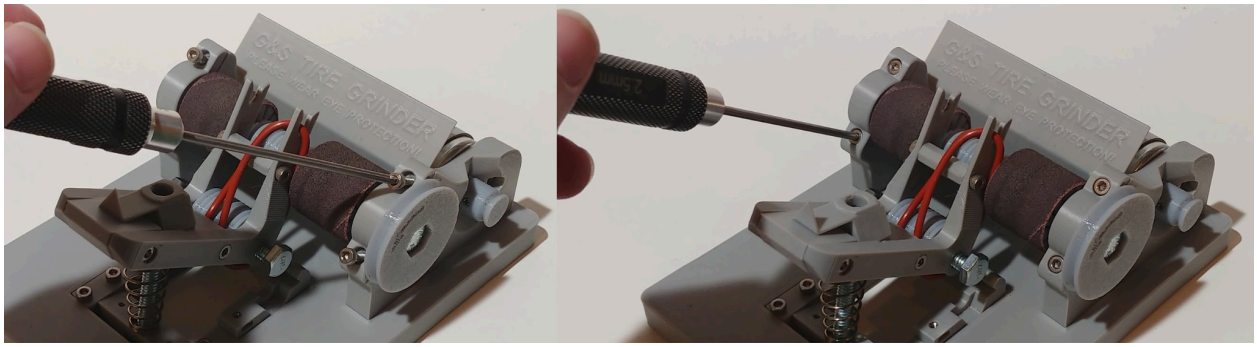
Step 10 - Hook the axle drive band around one of the axle bracket forks to keep it out of the way, then put the sanding spindle back through the other band, the one that is only around the idler pulley, so that the band is now on the center pulley of the sanding spindle. Make sure the large pulley is on the motor end, like it was before.



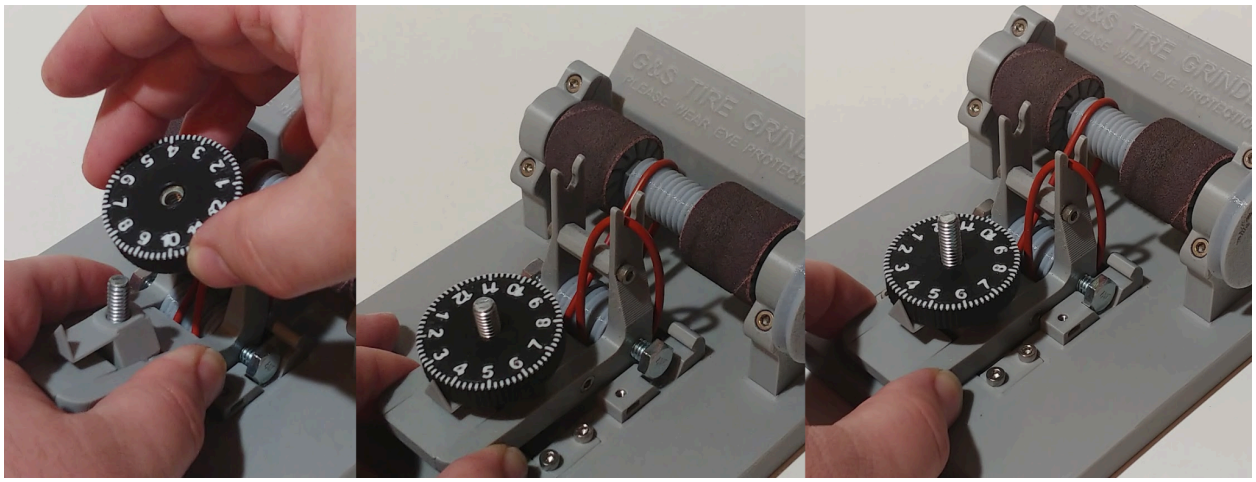
Step 11 - Put the sanding spindle back into the supports, and the axle bracket onto the adjustment bolt. Don't worry about the axle bracket pivot bolt yet. It can be up in the air for now.



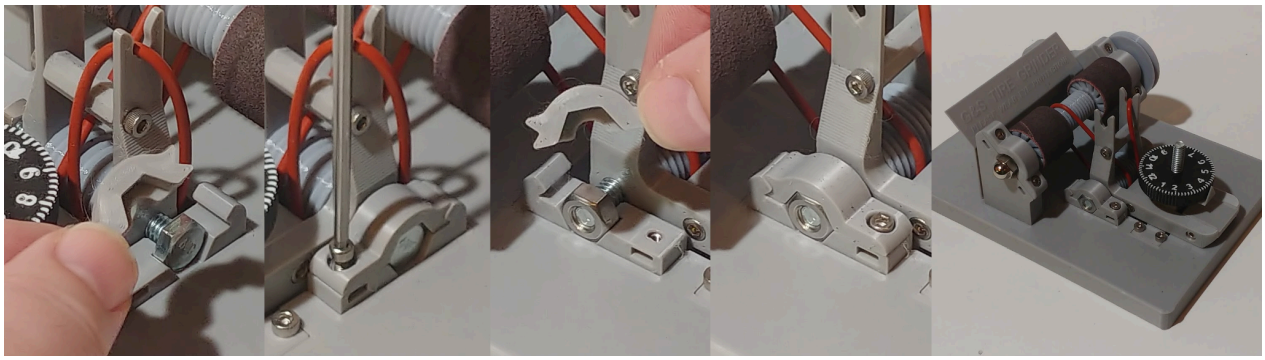
Step 12 - Replace the clamps at both ends of the sanding spindle, being careful not to cross-thread the screws. Tighten them down evenly until you feel resistance to tightening. They should not need to be tightened down hard, as doing so may deform the bearings and cause problems or excess wear.



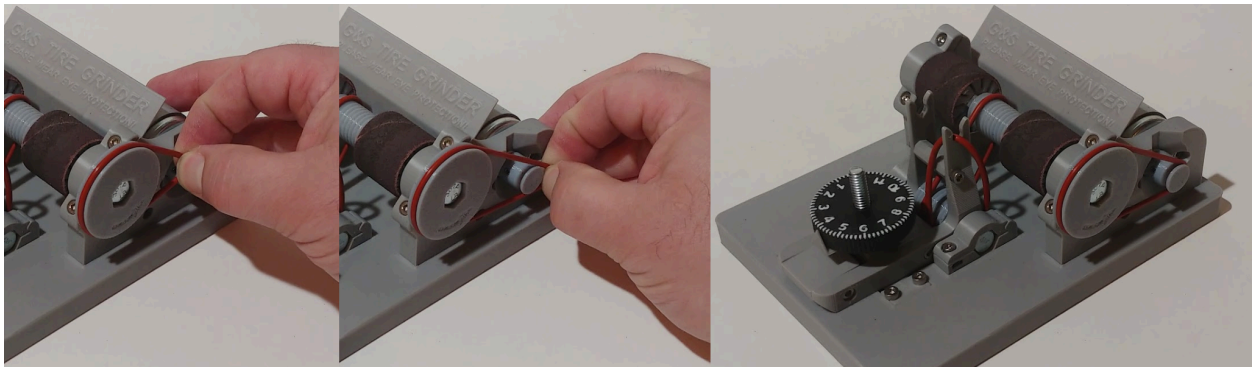
Step 13 - Replace the indicator knob and turn it down to force the axle bracket into place. As you are doing so, make sure the pivot bolt is lining up with the clamps below, adjusting the nut at the end as needed. Again, it should be snug, but not hard to press into place. A little loose is ok, because the clamps will keep the nut and bolt from turning apart. Tighten the indicator knob as much as you need to so that the pivot bolt is firmly in place.



Step 14 - Replace the clamps on the ends of the pivot bolt. Note that they are mirrored, and will only go on the correct side.



Step 15 - Last, but certainly not least, replace the main drive band by first wrapping it around the large pulley on the end of the sanding spindle, and then stretching it out and over the small pulley on the drive motor.



DONE! Your machine is ready to go back to work, though it wouldn't be a bad idea to check the tramming before your next set of tires, just in case.

Links

G&S Tire Grinder Setup and Use Manual (this document)
https://www.ggaub.com/slots/GnS-Tire-Grinder-Setup-and-Use.pdf

G&S Tire Grinder Setup and Use Video
https://youtu.be/5vuEkP1133g

G&S Tire Grinder Rubber Band Replacement Video
https://youtu.be/ol07BcVMcRQ

G&S Tire Grinder Assembly Manual
https://www.ggaub.com/slots/GnS-Tire-Grinder-Assembly-Guide.pdf

G&S Tire Grinder Assembly Video
https://youtu.be/yfhOtThl_8c

G&S Tire Grinder 3d models, and hardware list for DIY
https://www.printables.com/model/459450