Mini-piston to pneumatic switch

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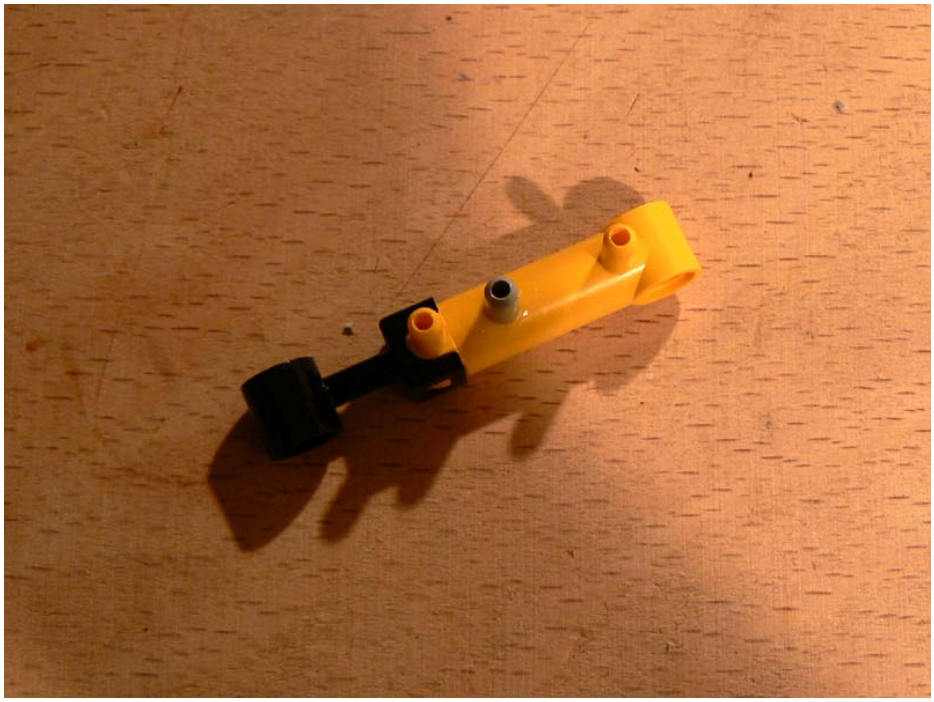
How-To

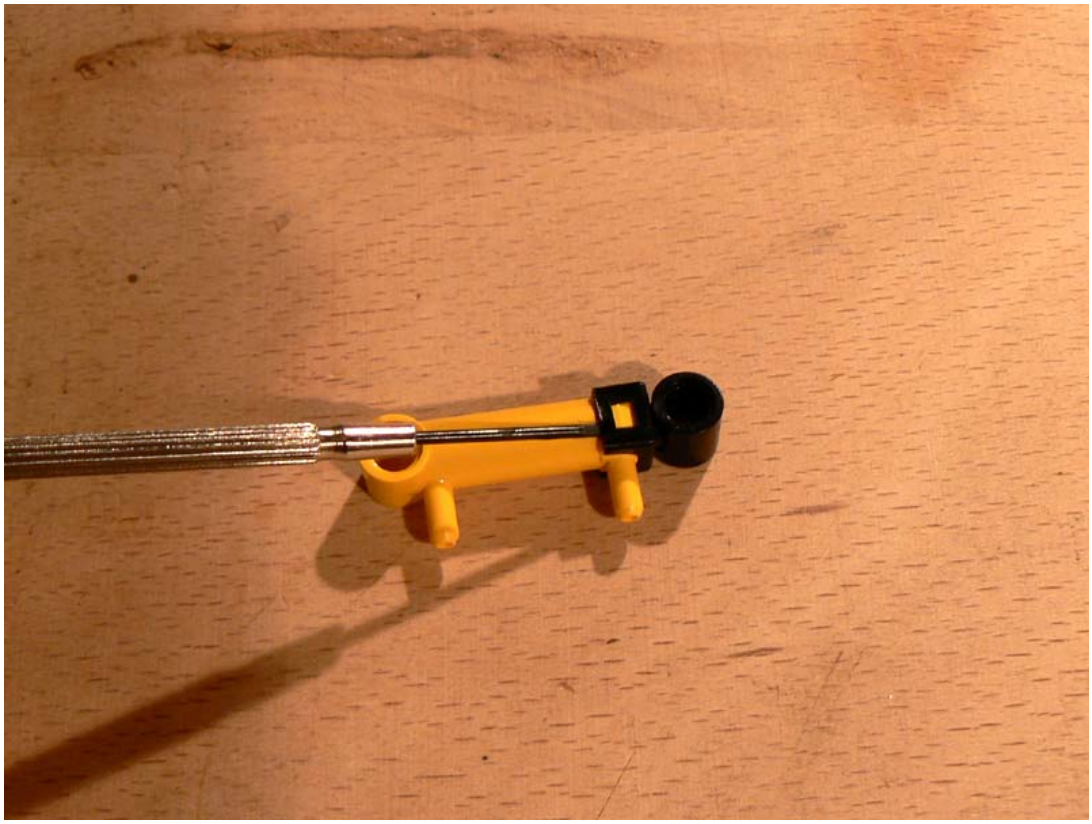
That’s what you have:

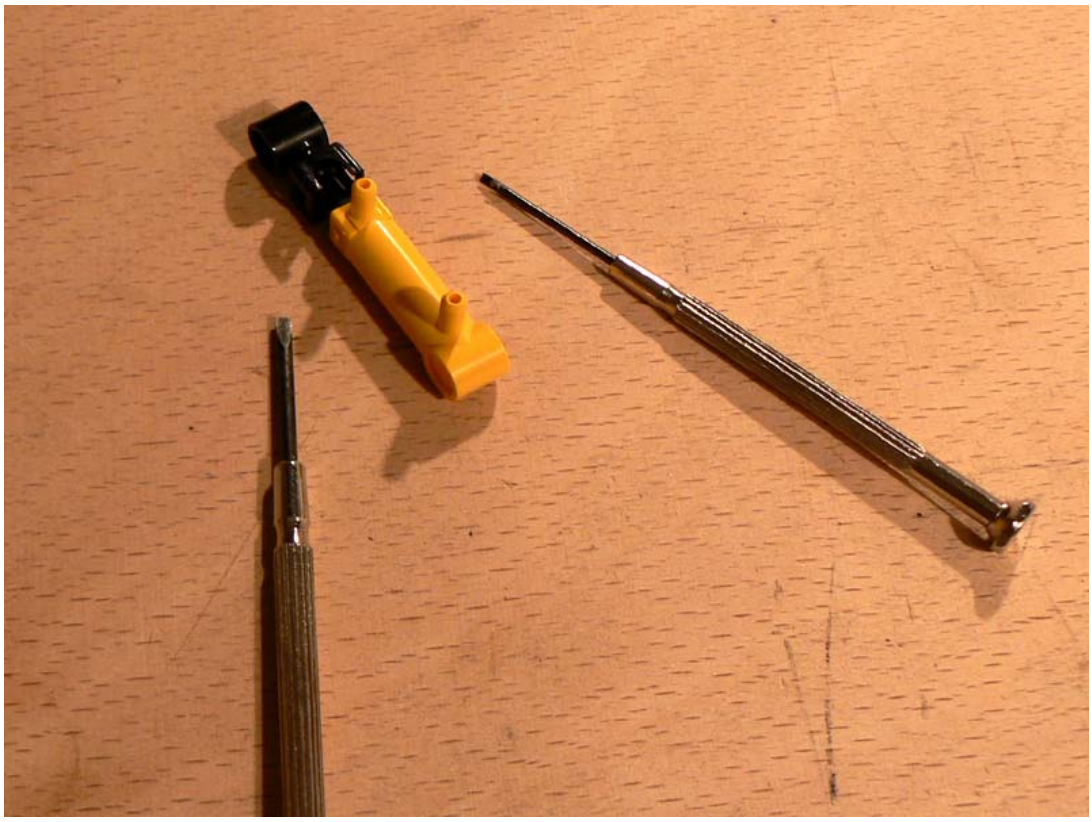
And that’s what you get :



(see last page for “what you need”)

1) First, you have to open the piston using a couple of TINY screwdrivers.





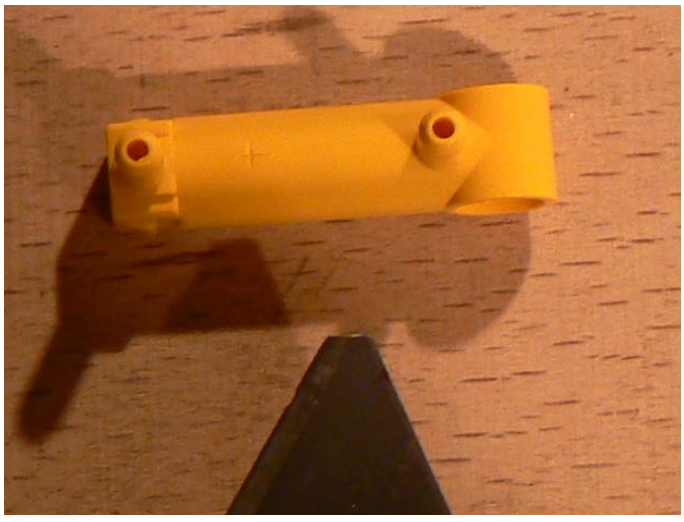
NB: In this phase, be careful with the yellow part; the black plastic is quite flexible but if you damage too much the two yellow retaining pins on the sides you won’t be able to securely close the piston.

2) Find EXACTLY where to drill the hole for additional pin: the CENTER of this one should be 7,2 mm from the CENTER of the farest pin (the one near the black part).

NB 1:Measurement can be done (a bit more) easily considering that the pins are 1,1 mm thick, so 7,2 mm center-to-center is 8,75mm side-to-center, as shown in the pic above.

NB 2: 7,2mm is the correct position for MY new engine geometry so anyone should do some math to evaluate his own best position.
However, considering that my previous geometry needed a distance of 7,5mm (which is 0,3mm difference), probably anything between this range should be ok.

3) Make a cross with a cutter in the correct drilling position, and try to CAREFULLY mark a small hole (again, with your cutter) so that your drill won't slide when you start spinning it.

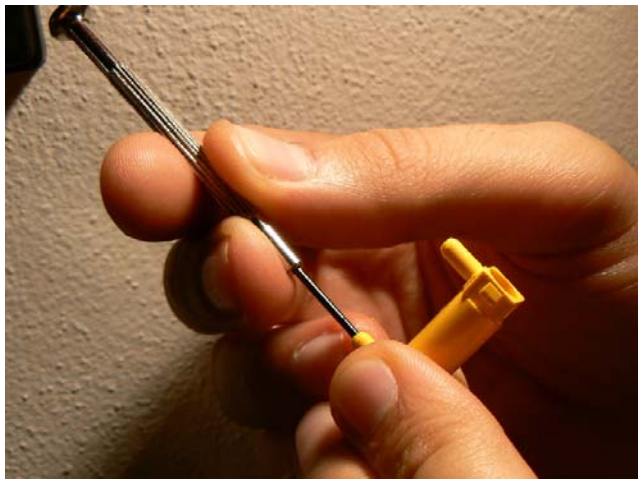


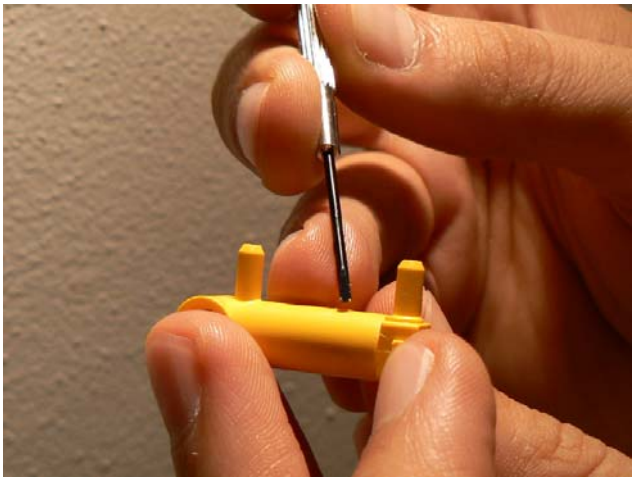
4) Lock your part (do NOT put the plastic part directly in contact with steel part or you will ruin your piston) and start to SLOWLY drill; if your drill do not have any speed regulator, it could be very hard to do that ! (Diameter I used for this job is 1,8mm).

NB: In this phase (and in the next one) you must be VERY careful not to damage the other side of the cylinder when your drill passes through the cylinder's wall.

5) Drill the two original pins with the same diameter (again, slow and careful with the drill…)

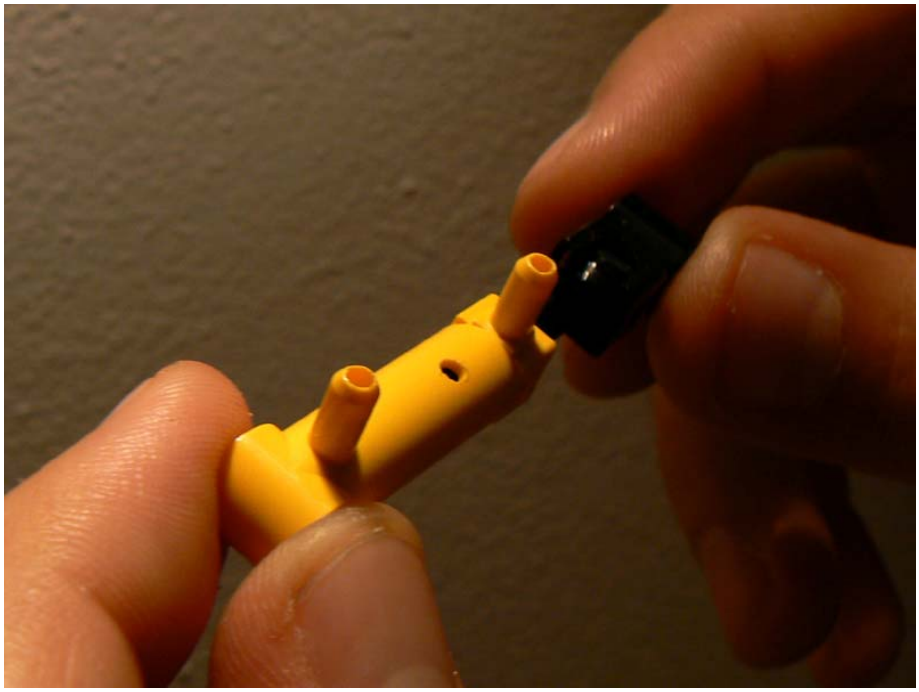
6) Accurately get rid of plastic crumbs inside the piston with the help of a tiny screwdriver.





NB: This is a very important step, because any left crumbs will damage the soft piston plastic!
So, consider spending at least 10 minutes for this for each piston.

7) Test the accuracy of your previous step: put the piston back inside the cylinder (WITHOUT locking it) and try to move it in and out a few times; if you feel some “roughness”, then remove the piston and repeat step 6 until everything moves smoothly.

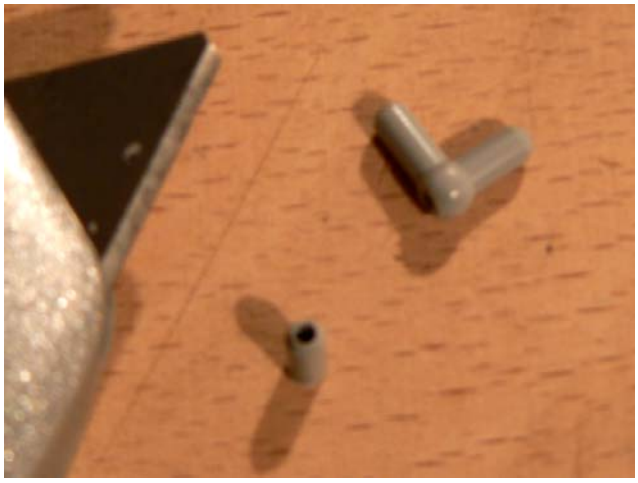


NB: Put particular attention in the central hole zone: you could need to unsharp the inner edges of the hole with your screwdriver.

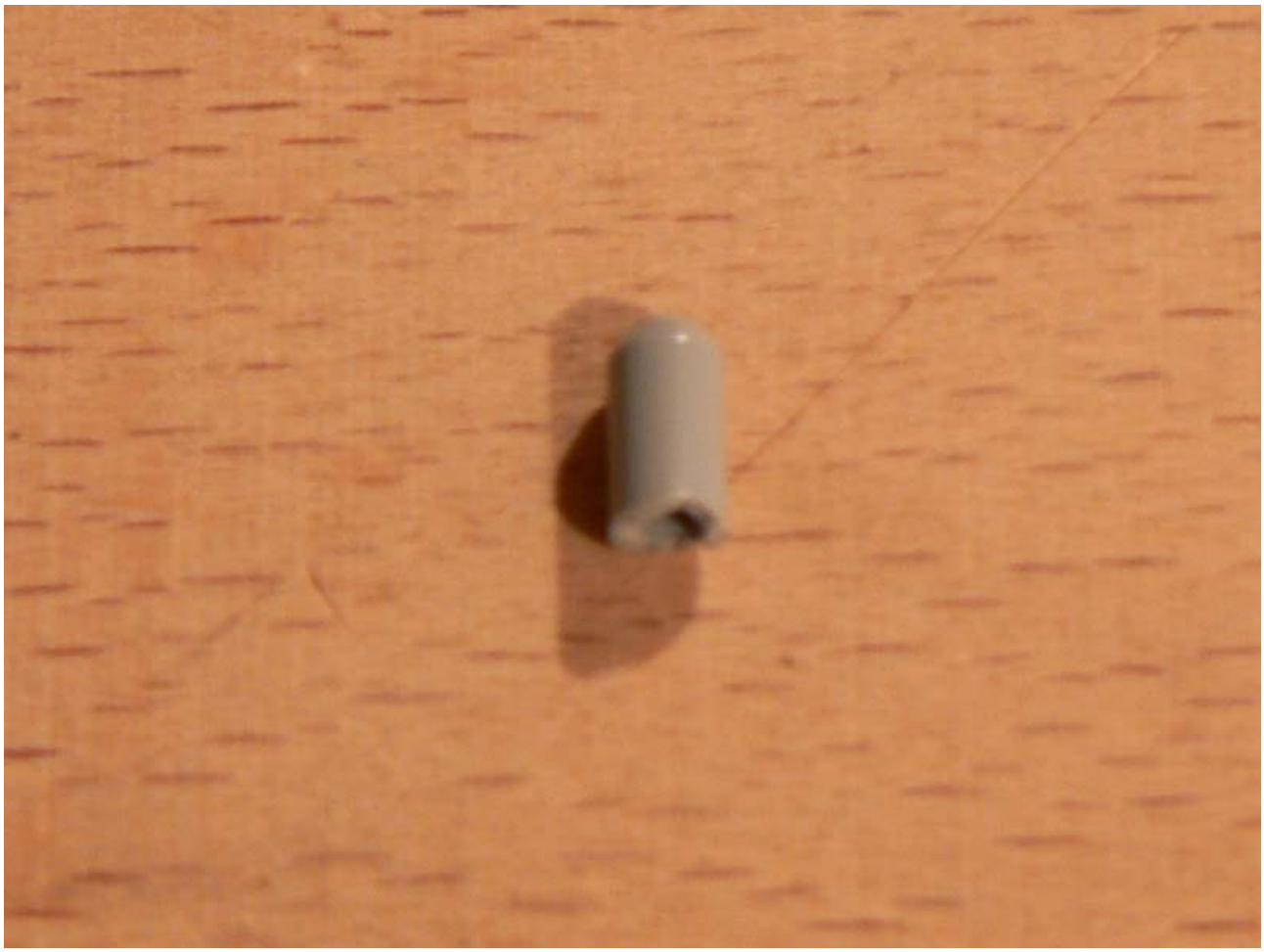
8) It’s time to add the extra pin, but first you have to build it! First of all lock one of your “T” connectors and drill its inner holes with the same diameter used before (1,8mm).

NB: No matter if you ruin the central spherical part because you won’t need it.

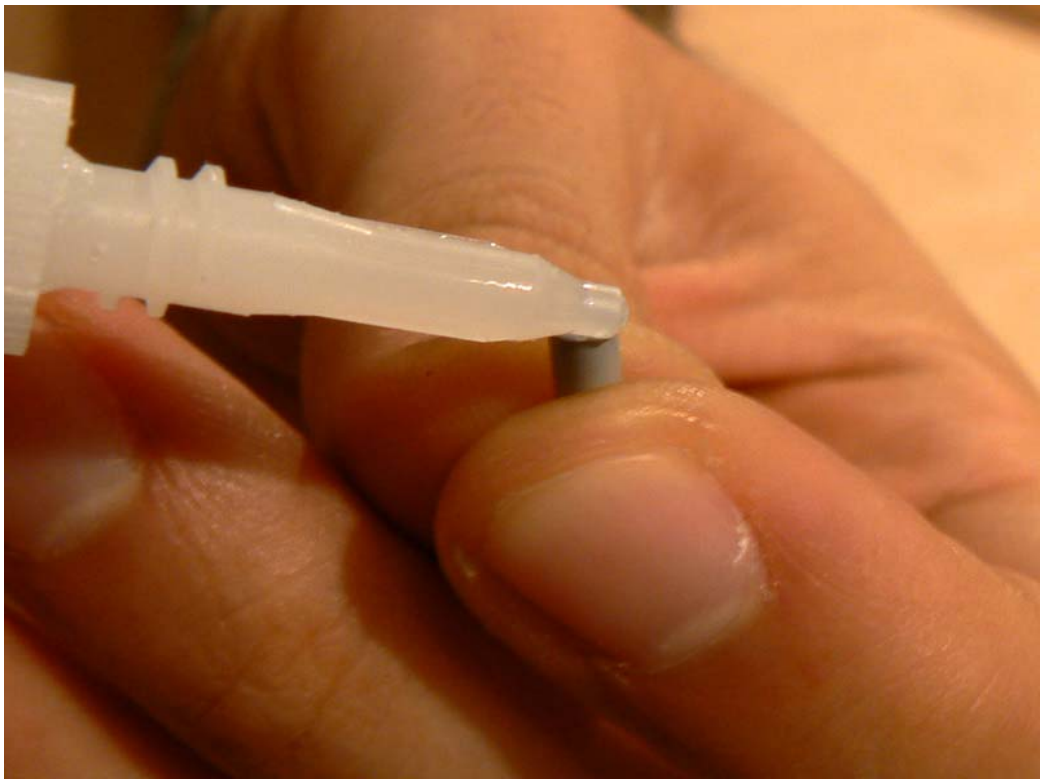
9) Cut one of the grey pins with your cutter.



10) Refine the little pin, giving it’s base a curved shape, so it fits better the round surface of the piston.



11) Put a thin superglue (I used Loctite) on the dase of the pin, being careful not to drop some inside the hole.

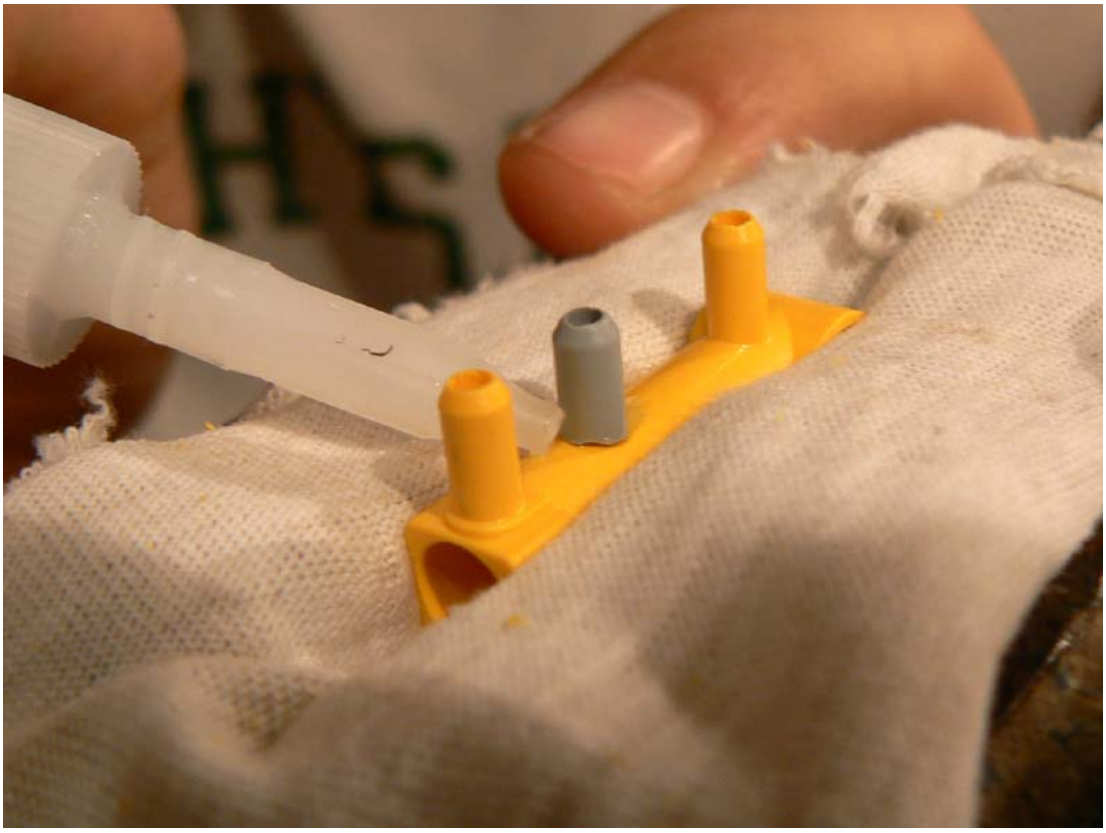


NB: If some glue drops inside the hole, you can quickly remove it with your mini screwdriver, BEFORE it dries !!

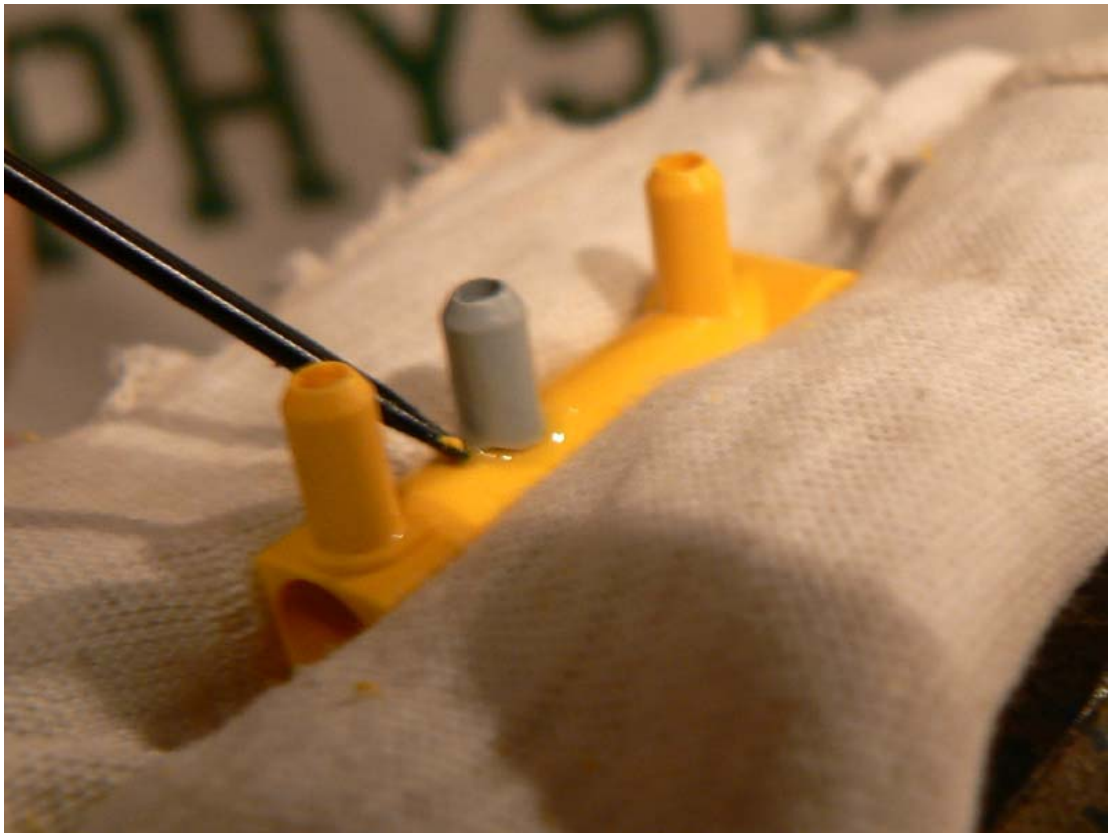
12) Put the grey pin over the extra hole you drilled before, paying attention to EXACTLY align the holes.

NB: You have a couple of seconds to center the holes before superglue locks !

13) Wait 5 minutes, then apply another (quite big) layer of superglue ALL AROUND the junction between the yellow cylinder and the grey pin, so that the linkage gets stronger AND any accidental air wayout gets closed.



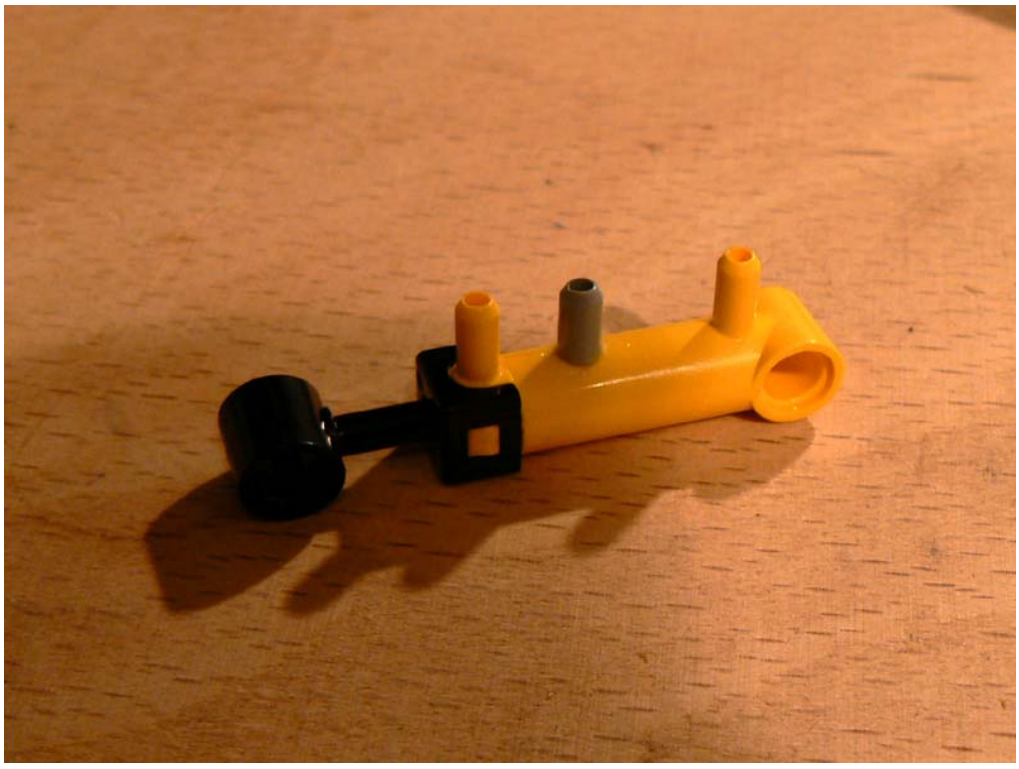
NB: you can use your tiny screwdriver to distribute the superglue before it dries.



14) While you wait for the extra glue to dry (I suggest AT LEAST 5-6 minutes), clean the soft rubber piston and its axle with a towel, and then put some silicon lube on them (again, you can use your useful tiny screwdriver); you don't need to apply a large amount of lubricant.

NB: if you use the same tool for removing extra glue AND apply the silicon lube, remember to CLEAN IT WELL between the two operations !!

15) Carefully put the piston inside the cylinder, so that the lube won't flow outside, and lock the two parts together.



Ok, You're done !!

Just remember, before putting the part inside your engine, to move it in and out by hand a few times, and to apply some circular motion too, in order for the lubricant to reach every corner of the piston.

FAQ's:

1- **"How do calculate the exact pin position for my engine geometry ?"**
This is just a matter of 90° triangles, but if someone has some troubles with that I can write a specific guide

2- **"What do I need for this job ?"**
- **As many LEGO pneumatic small cylinders as you want to convert**
- **1 "T" pneumatic connector for each 3 pistons**
- **2 tiny screwdrivers**
- **Some small towels**
- **A vice (or something similar)**
- **A drill, with a 1,8 mm tip**
- **Superglue**
- **Silicon lube**
- **More or less 90 minutes for 4 pistons**

3- **"What ???"**
Sorry, English is NOT my language… please forgive any bad syntax error in this document ☺

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