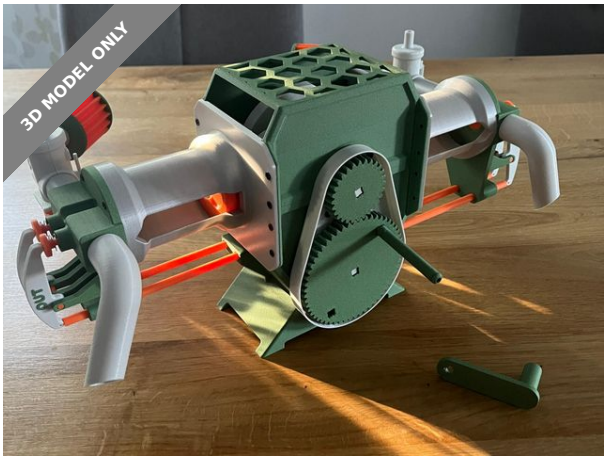


Boxer engine, 250 cm³, functional valves.

BlackSabbath

VIEW IN BROWSER

updated 1. 7. 2024 | published 1. 7. 2024

Summary

This model features a 2-cylinder boxer engine with two valves per head operated via pushrods.

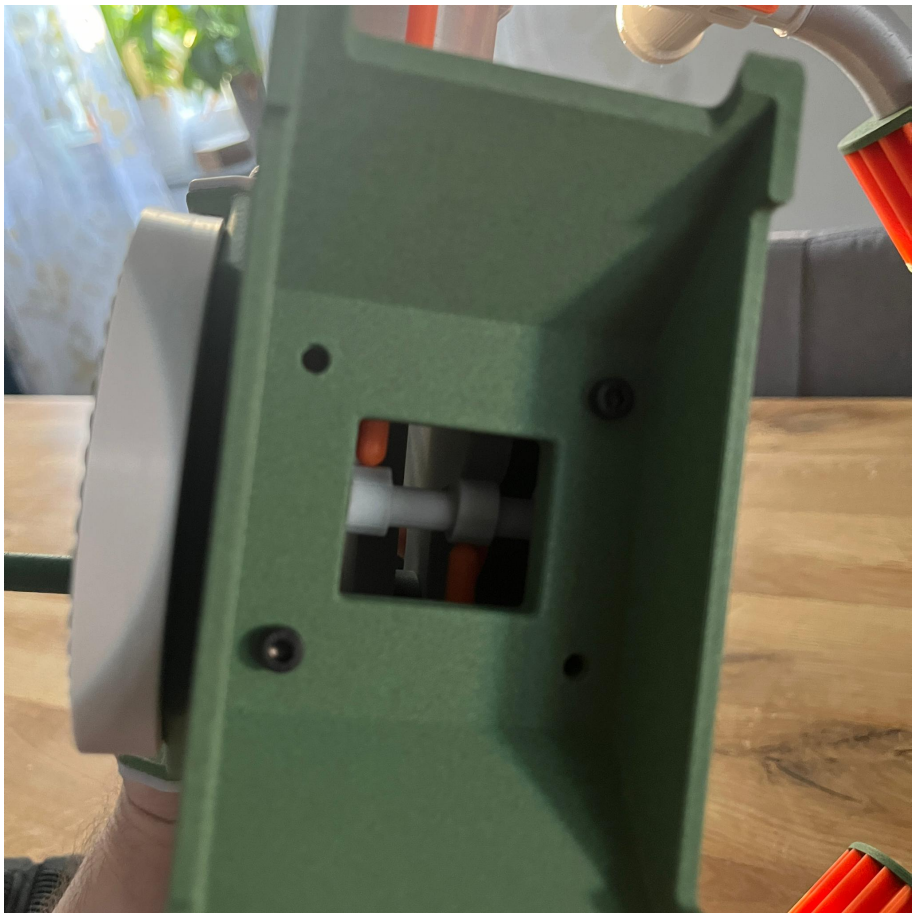
Hobby & Makers > Automotive

Tags: motor mechanical mechanism education engineering working engine cylinder bike boxer motorbike bmw german fuel technic

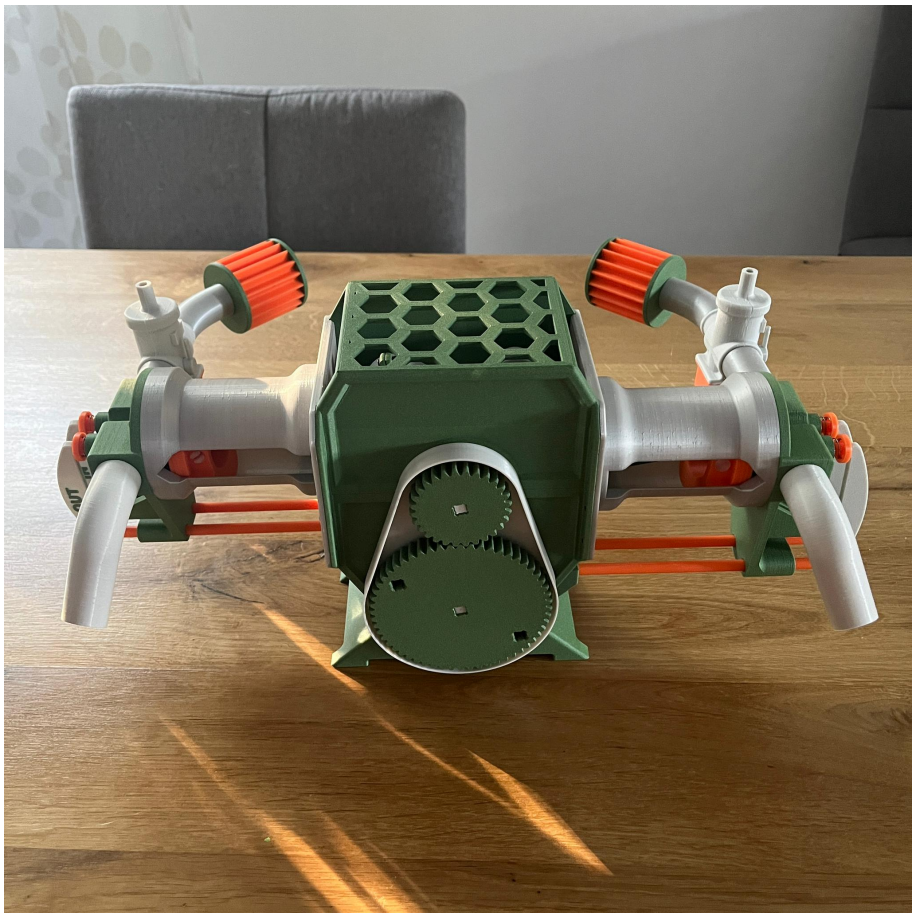
Information (Please read it)

This model features a 2-cylinder boxer engine with two valves per head operated via pushrods. The camshaft is located below the crankshaft and is driven by a spur gear.

Camshaft:



Front view with spur gears:

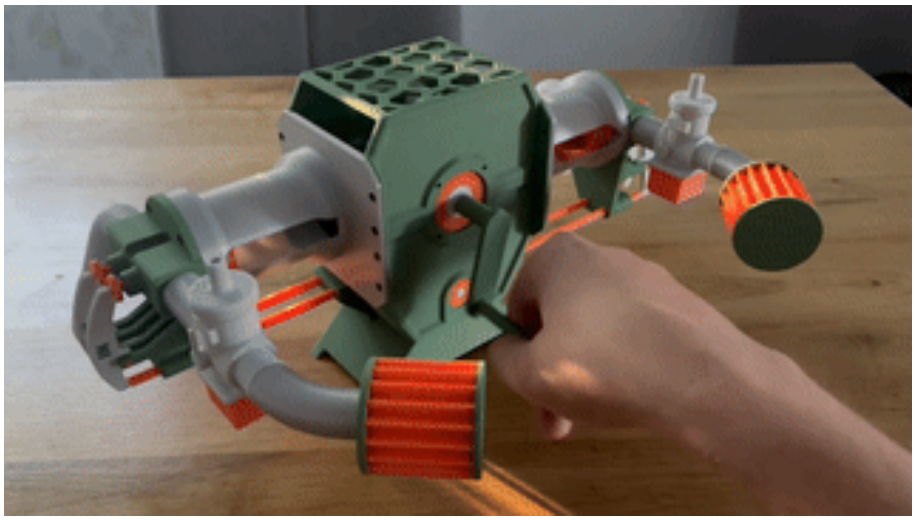


The bearings used in this model were sourced from this user. However, you can also use real steel bearings. The crankshaft uses 6004 bearings, and the camshaft uses 608 bearings.

The cylinders and connecting rods are connected with M3 screws. The stand is attached to the housing with M4 screws. You can use countersunk screws with Phillips heads or external hex screws.

The engine can be driven with a crank on the clutch side or via the camshaft gear. When driven via the camshaft gear, the engine turns quickly, allowing a clear view of the valve lift operation.

Crank on the clutch side:



When driven via the camshaft gear (real speed)crank on the camshaft gear:

And now some information about printing:

I printed the housing in PLA-CF and highly recommend it. Supports are not necessary for the housing.

I printed the cylinders in PETG, but vertically. Supports are needed for this. I used PLA as a separation layer, which made it easy to separate the parts. Of course, you can also do it the other way around, with the cylinders in PLA and the separation layer between the supports in PETG, but then you need to disable cooling for the PETG to prevent warping and reduce the speed to a minimum of 20 mm/s. The cylinders and the crankshaft are the only parts that require supports, with the crankshaft using a PETG separation layer.

The crank consists of 4 parts: a lever that can be mounted on the clutch side and a handle that consists of 3 parts. The handle has a hollow shaft which is slid onto the handle and secured with a counter pin using an M2 screw.

It's crucial that the cylinders are mounted as shown in my pictures to ensure the valve timing is correct. The rocker arms are labeled with IN and OUT.

The exhaust system, pushrods, crankshaft, and camshaft need to be glued. I recommend deburring the glued parts if there's a noticeable edge between them.

Each valve consists of two parts, the head and the actual valve, which can be easily snapped together. The friction is sufficient to hold the two parts together. I wouldn't recommend gluing them in case the valve needs to be disassembled. The springs have a diameter of 10mm and a height of 15mm.

The assembly is quite intuitive, but here are the steps for clarity:

1. Glue the camshaft together and mount the bearing (608) on the gear side, but not all the way to the cam. The outer edge of the bearing should be flush with the connection where the gear will be attached.
2. Install the other bearing (608) inside the lower housing. Then, the camshaft with the already mounted bearing can be inserted through the bore.
3. Glue the crankshaft together and mount the bearings (6004).
4. Attach the connecting rods to the crankshaft.
5. Attach the pistons to the connecting rods.
6. Mount the crankshaft onto the lower housing.
7. Now, the cylinders can be bolted to the lower half of the housing. Note that when viewing the side with the gears, the actual cylinder should be positioned further back. Of course, before mounting the cylinders, slide the pistons through.
8. Place and bolt the upper housing half.
9. Assemble the valve heads.

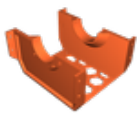
10. Install the pushrods and then attach and bolt the cylinder heads to the cylinders.
11. Next, the exhaust pipes, carburetors, and filters can be installed. Each carburetor consists of four parts that need to be glued together. Each filter consists of two parts that can be snapped together (gluing is optional).
12. The gear cover can be bolted on.
13. The gears can be mounted, but first, the valve timing must be set. This should be done from the clutch side. The gears must be positioned so that when the left piston reaches the top dead center, the OUT valve opens (exhaust stroke), and when the piston returns, the IN valve should open next (intake stroke).

In essence, if you follow these steps, you should be rewarded with an engine that not only works but also looks like it knows what it's doing. Happy assembling!

I would be grateful for a donation (PayPal), even if it's just a few cents.

Model files

001_housing_buttom_part.stl

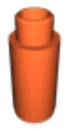


002_housing_lower_part.stl

003_feet.stl

004_cylinder_one_two.stl

005_cylinder_bolts.stl



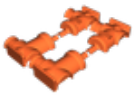
006_exhaust_pipe_long.stl

007_exhaust_pipe_short.stl

008_exhaust_pipe_round.stl

009_exhaust_end_short_and_long.stl

010_rocker_arms.stl



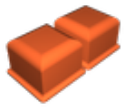
011_carburetors.stl

012_carburetor_connection.stl

013_spur_gear_cover.stl

014_cylinder_heads.stl

015_connecting_rods.stl



016_carburetors_containers.stl

017_gear_z1.stl

018_gear_z2.stl

019_crank_part_1.stl

020_crank_part_2.stl

021_crank_part_3.stl

022_crank_part_4.stl

023_crankshaft.stl

024_camshaft.stl

025_piston.stl

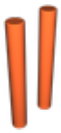
026_bearings_6004.stl

027_bearings_608.stl

028_valves_part_1.stl

029_valves_part_2.stl

030_valve_rods.stl



031_bolts_rocker_arms.stl

031_filters_part_1.stl

032_filters_part_2.stl

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