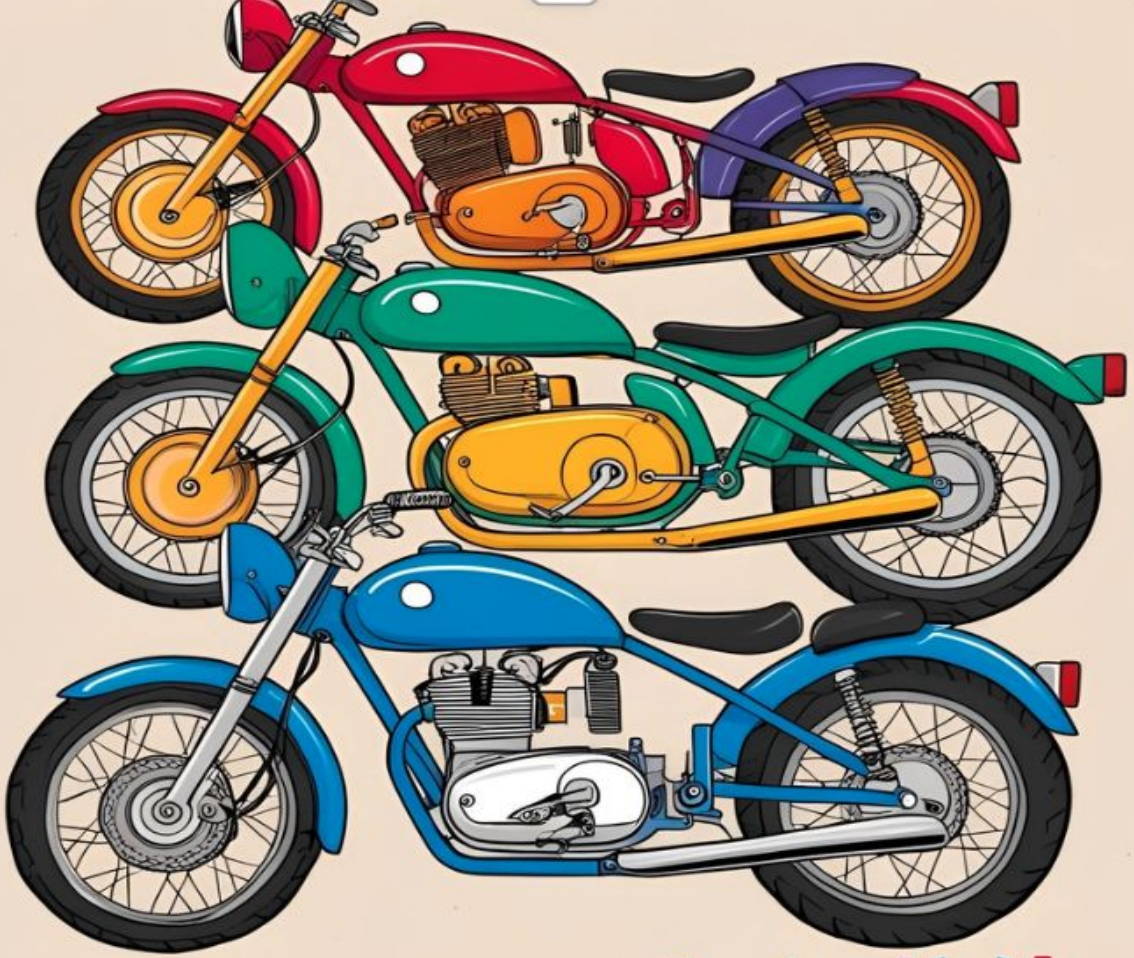


By: Mären, Evie änd AVA

THE ASSEMBLY GROUP

Swing Arm Assembly / Rear Suspension

- **What is a swing arm?**
  - A pivoting part that holds the rear wheel in place.
  - It supports and suspends the rear wheel.
- This assembly required us to hard press two bushes, a spindle and a shim in place
- There were no available shim parts, so we visited the Workshop to make our own.
  - We took measurements of the swing arm to find the needed diameters, then programmed our numbers into CAD (Computer-Aided Design software)
  - Using a water jet and the CAD design, we were able to carve a shim out of a piece of scrap metal.
    - CAD helped us define the inner and outer diameters of the shim and sent measurements straight to the water jet.

Issues with the Swing Arm

- Pressing the bushes into the frame had caused them to compress in size and the spindle was unable to fit.
- Using a ream, we enlarged the diameter of the bushes, and were then able to press in our spindle and shim into the swing arm.
    - A ream is a cutting tool used to expand existing holes to an exact diameter.
- Finally, we attached the swing arm into the mainframe and completed the first major step of our assembling process.

Torque

$$\tau = rF\sin(\theta)$$

What is it? A measure of the force that causes an object to rotate.

The swingarm connects the rear wheel to the frame of the motorcycle and pivots for suspension/movement purposes.

- Torque is an important factor in this, as it affects the swingarm pivot bolt
- Torque creates tension in a bolt
    - Too little torque can cause the bolt to loosen which could prove to be fatal while riding the motorcycle
    - Too much torque could also damage the bolt by damaging threads
- Correctly torquing allows the swingarm to move freely during suspension travel, without risk of excessive play and safety hazards

Front Fork Assembly

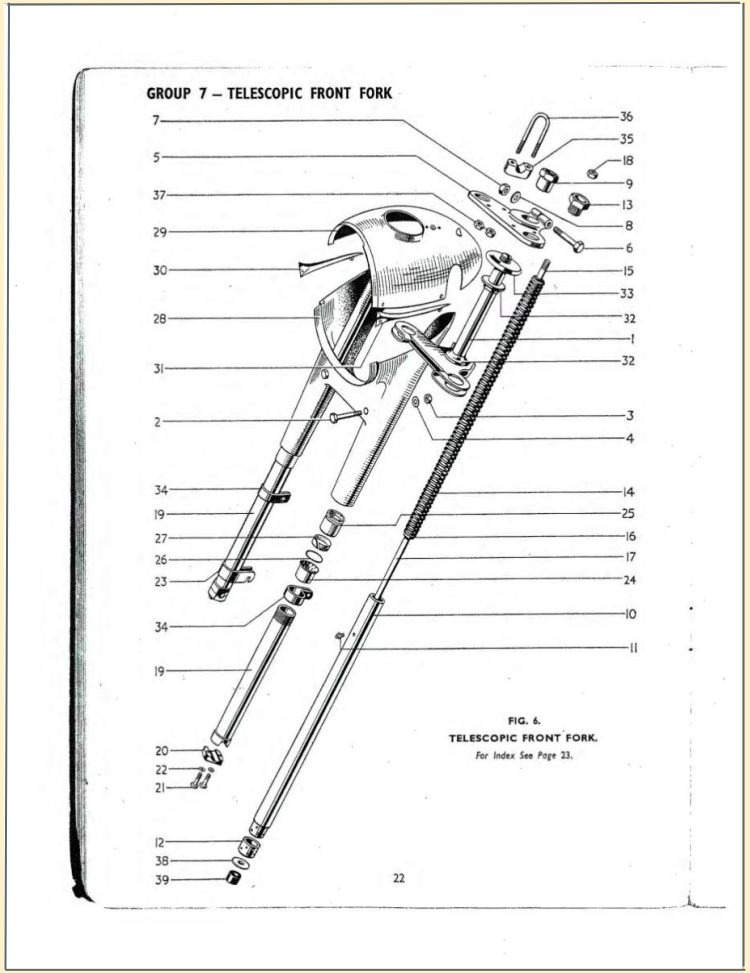
The next step of the project involves the assembly of the front fork, a process that took approximately two to four lab days to complete. One of the largest challenges throughout this process was the thorough cleaning of the build-up oil residue and grime from the spring and interior front tube.

Mechanically, the front slider must have linear movement in the front tube with minimal friction to allow functional and smooth suspension travel. The residual oil and debris can increase the surface roughness and impede the rebound sanction in the suspension front fork assembly. The fork tube and slider is critical to absorb the shocks or bumps in the road effectively while simultaneously maintaining ride stability.

Once the major aspects of the front fork was properly assembled, we mounted this part onto the bike's frame. The most difficult aspect was aligning and securing the front wheel properly. The position of the axle within the fork dropouts had to be precise and tighten the axle holder uniformly to avoid any misalignment. The proper alignment is pivotal for the structural integrity and performance of the front suspension. This step was extremely time consuming and demanded the patience/attention to detail to achieve the functionality, accuracy and safety.

Handlebars:

Brief note that we attached the handlebars to the top of the front fork assembly. The handlebars rested on top of the top triple clamp, resting on small support blocks, with U-Bolts over the bar to hold it securely in place.



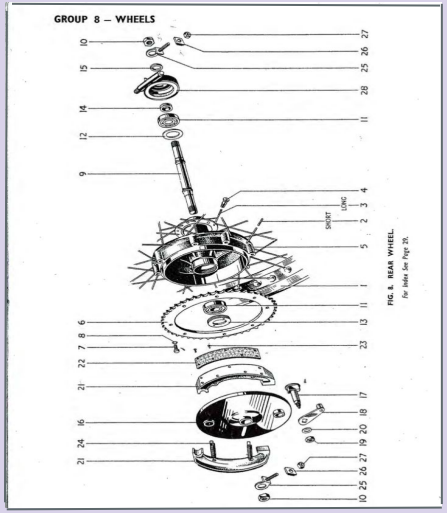
Front Wheel/Back Wheel Brake Assembly

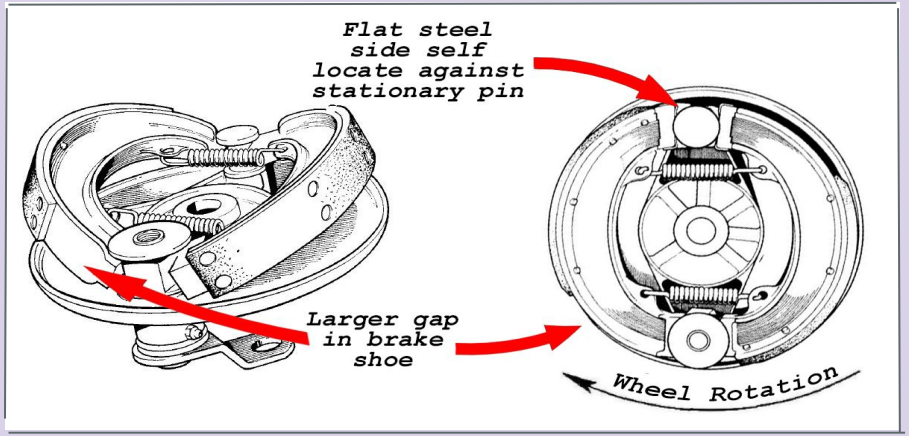
We started to work on the front and rear wheel assembly on March 19th. This was an arduous task, as the majority of the pieces required and abundance of cleaning and sanding to remove debris and rust. We spent around 2 lab days alone to assemble the the brake plates only. The tight screws inside made the assembly very difficult to lock into place.

The assembly process - Snap the two brake pads with the two brake springs attached. Snap these two pieces over brake pull arm bolt and lock it into place within the brake plate. This process was tedious and time consuming. It took immense strength and multiple tries to stretch the stiff brake springs enough to go over the arm bolt.

How do the brake plates work? When you pull on the brake lever, it operates the brake cam/actuating arm (#17/18 on diagram) on the brake plate. The cam rotates and pushes the brake pads outward, forcing them to make contact with the rotating drum inner surface. This friction allows the brake pads and the drum to slow down the wheel.

Demonstration of the process and what the finished result looked like.





Technicalities: Corrosion Prevention

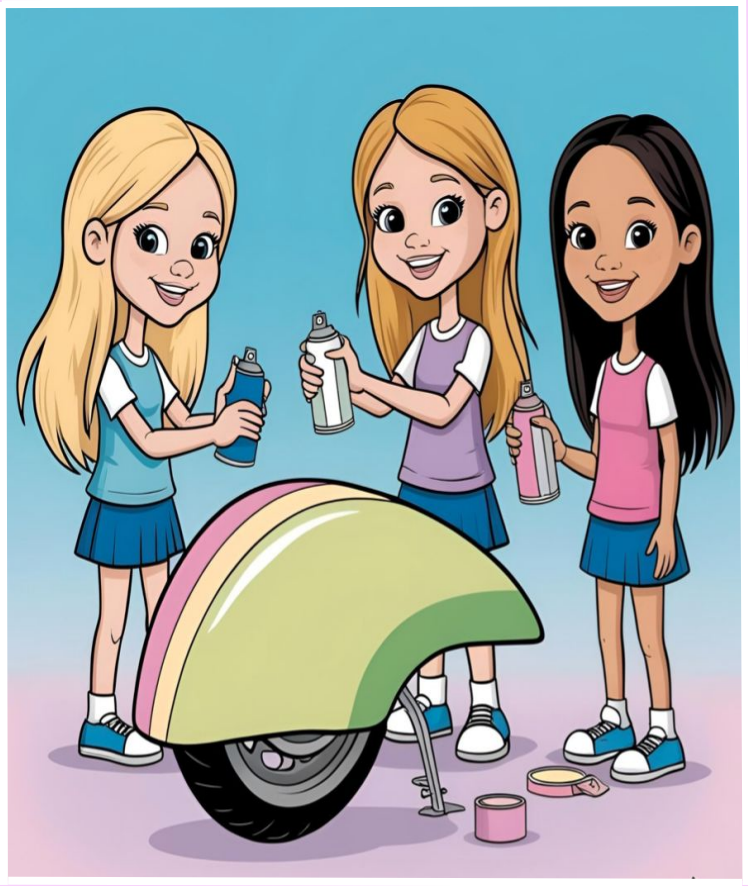
- We spent a long of time removing rust from different parts of the motorcycle in order to prevent corrosion
- Corrosion is rust on the motorcycle parts and it is the result of an electrochemical reaction between metal, oxygen, and moisture (water), and this reaction creates the rust
    - **Iron (Fe)** can lose electrons to form **Fe^{2+}** or **Fe^{3+}** ions. These released electrons are taken up by **oxygen (O_2)** and **water (H_2O)** in the environment, producing **hydroxide ions (OH^-)**. The hydroxide ions then react with the iron ions to produce **iron oxide hydrate ($Fe_2O_3 \cdot xH_2O$)**, commonly known as rust. This entire process is a redox reaction, iron undergoes oxidation, while oxygen is reduced.
- If rust is not fully removed it will continue to react underneath paints surface
- Sanding is a good solution because it removes the oxidized layer and any loose paint that may have corrosion
- Additionally we always apply a primer to seal the moisture and oxygen to prevent future corrosion

Prep for Paint

- We needed to remove all the rust from the parts because the rust could…
  - Continue to grow underneath the primer and paint, and would eventually crack and bubble
  - Create poor adhesion/ lead to flaking and peeling
    - Smoother or dirty surfaces (like glossy metal or old paint) have lower surface energy, which makes it harder for paint to "stick."
  - Weaken the metal; Rust eats away at metal parts, which can cause them to fail eventually over time
  - Ensure the paint will last a long time
- We used wire brushes and sandpaper to remove the rust and create an even and level surface, making sure the paint would be more durable and look cleaner.
  - Sanding increases surface energy by creating tiny grooves and scratches, giving paint more surface area to bond mechanically (aka mechanical adhesion)

Priming and Painting

- After we removed the rust and sandblasted the fenders and fuel tank, we used Bondo Body Filler to fill some holes/dents on the parts.
  - Bondo is a polyester resin-based filler that you combine with a benzoyl peroxide hardener and catalyst.
  - The chemical catalyst hardens the Bondo (that is like a putty consistency) when combined
  - To figure out how much of each we needed to add into the mixture, we followed the following equation:
    - H= 0.02 x B
      - The amount of hardener to add is 2% of the amount of base used.
  - The mixing process has an exothermic reaction and generates heat.
- We let the parts set for 24 hours, then sprayed them with primer.
  - Primer helps paint adhere to the surface and creating a smoother and cleaner finish
  - Primer also prevents rusting



Thank You

From:
Maren, Ava, and Evie.