E-Bike Converter:
Front Wheel Friction Drive for TfL bike.

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Introduction

What is the problem we are addressing?
TfL bike scheme facilitates exploration of London but is difficult for older demographics to use.

Our product converts a TfL bike to a motor assisted E-bike for increased accessibility.

How does our design do this?
Provides torque to the front wheel, accelerating bike.
Small and portable, can be carried by user when not in use and easy to attach.

Position on Bike:
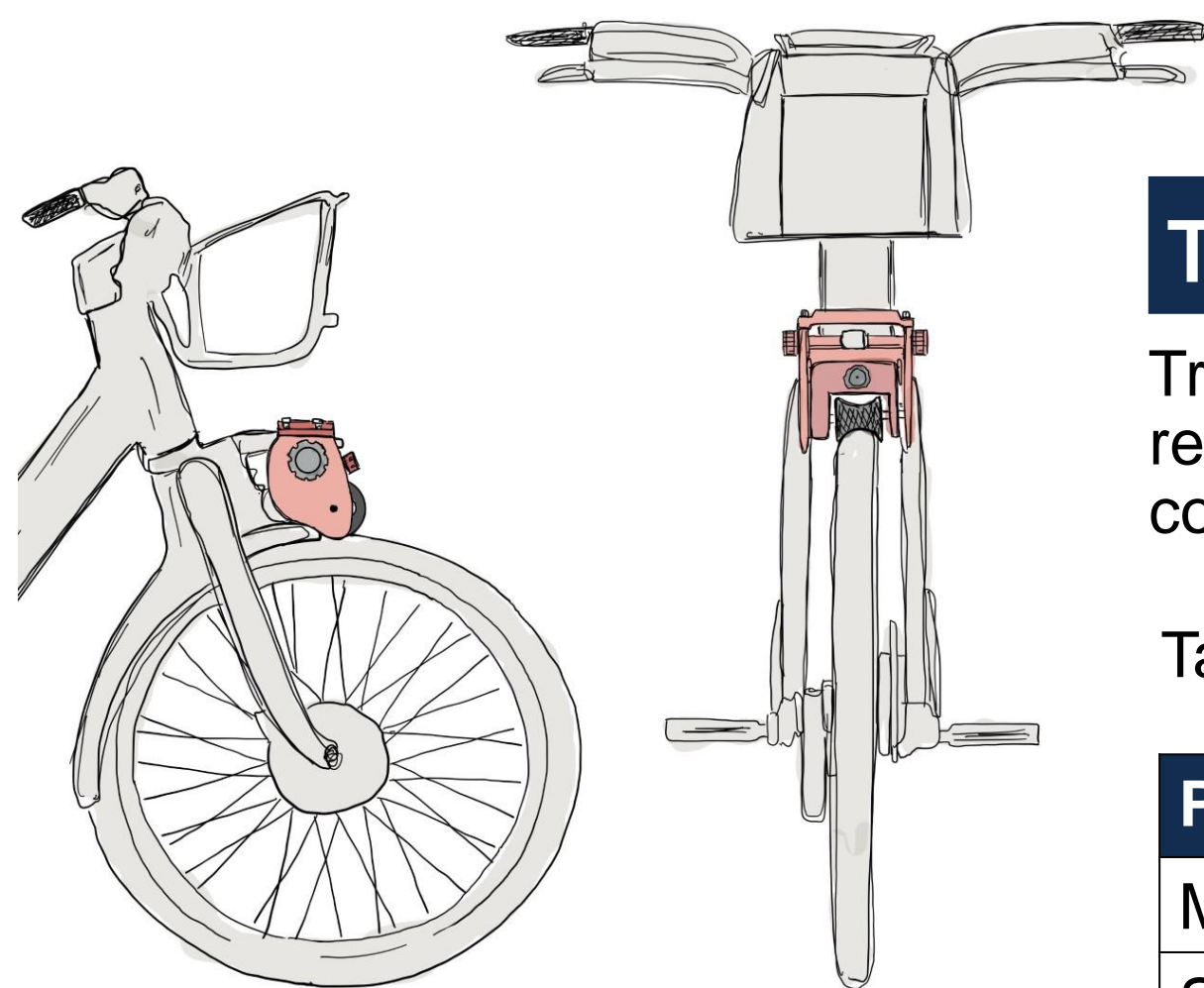Design works in synergy with TfL bike:

Figure 2. Converter Position on Bike.

- Fits into existing features.

- Unobtrusive and does not look out of place.

- Moves with docking port, will not affect steering.

Clamp Thumbscrews — Mounting Clamp — Tilt Adjust Dial — Rod Endcaps — Battery Pack (On both sides) — Drive Wheel

Figure 1. Overview of Design

Transmission & Performance

Transmission uses a single reduction system that requires only 4 outsourced components, keeping cost down.

Table 1. Performance of Transmission

Performance Characteristic	Value
Motor Operating Speed (RPM)	18000
Service Life (Miles)	1800
Expected Battery Life (Minutes)	40
Charge cycles	250

TfL Bike ride without paying extra is 30 mins (1), so battery life is sufficient.

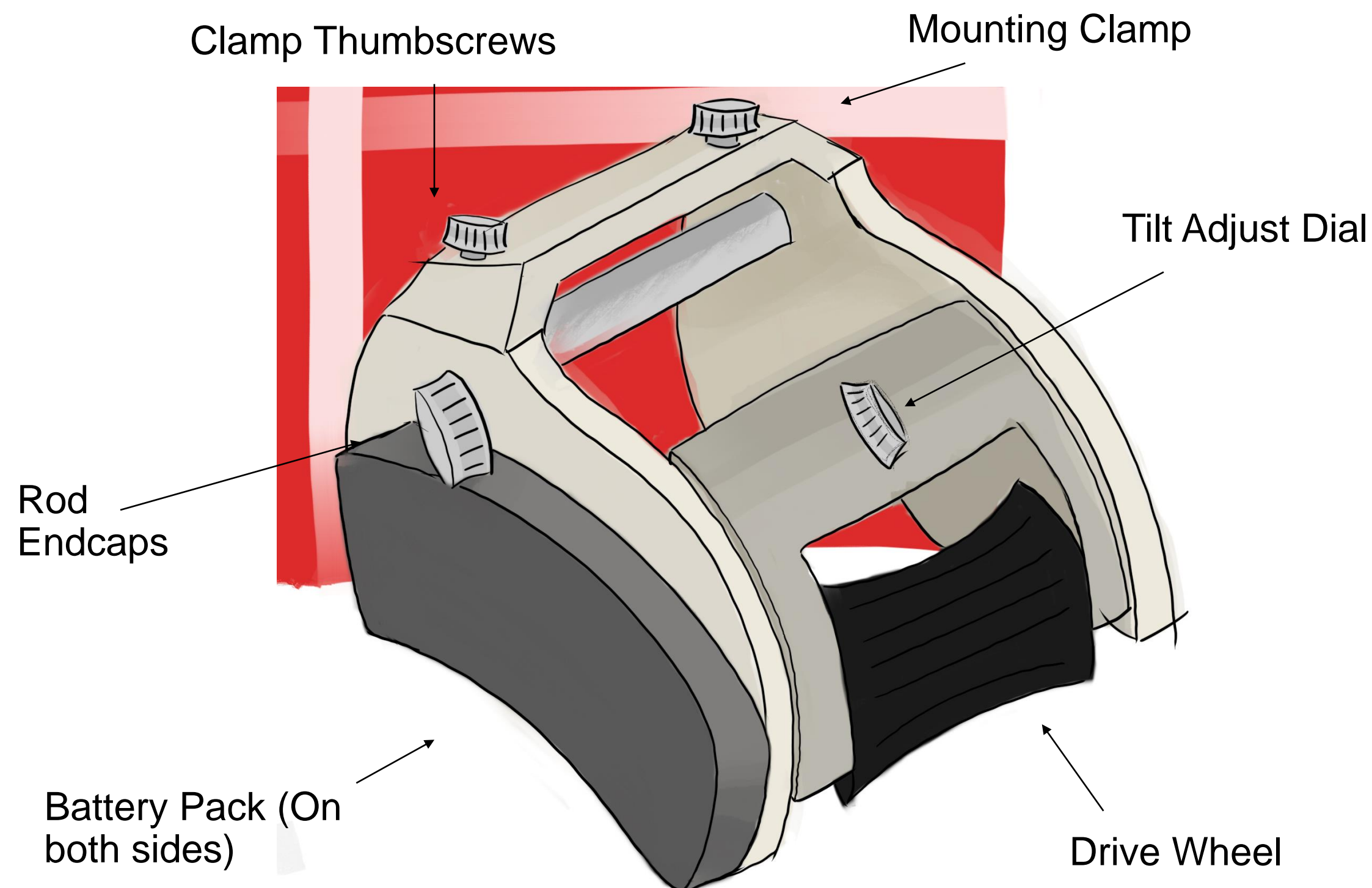The output speed will increase the bike to 14.5 mph without pedalling which is below the max legal speed

Future Developments

Shaft is a specialized alloy that will increase cost. Future design should use cheaper metal for mass production
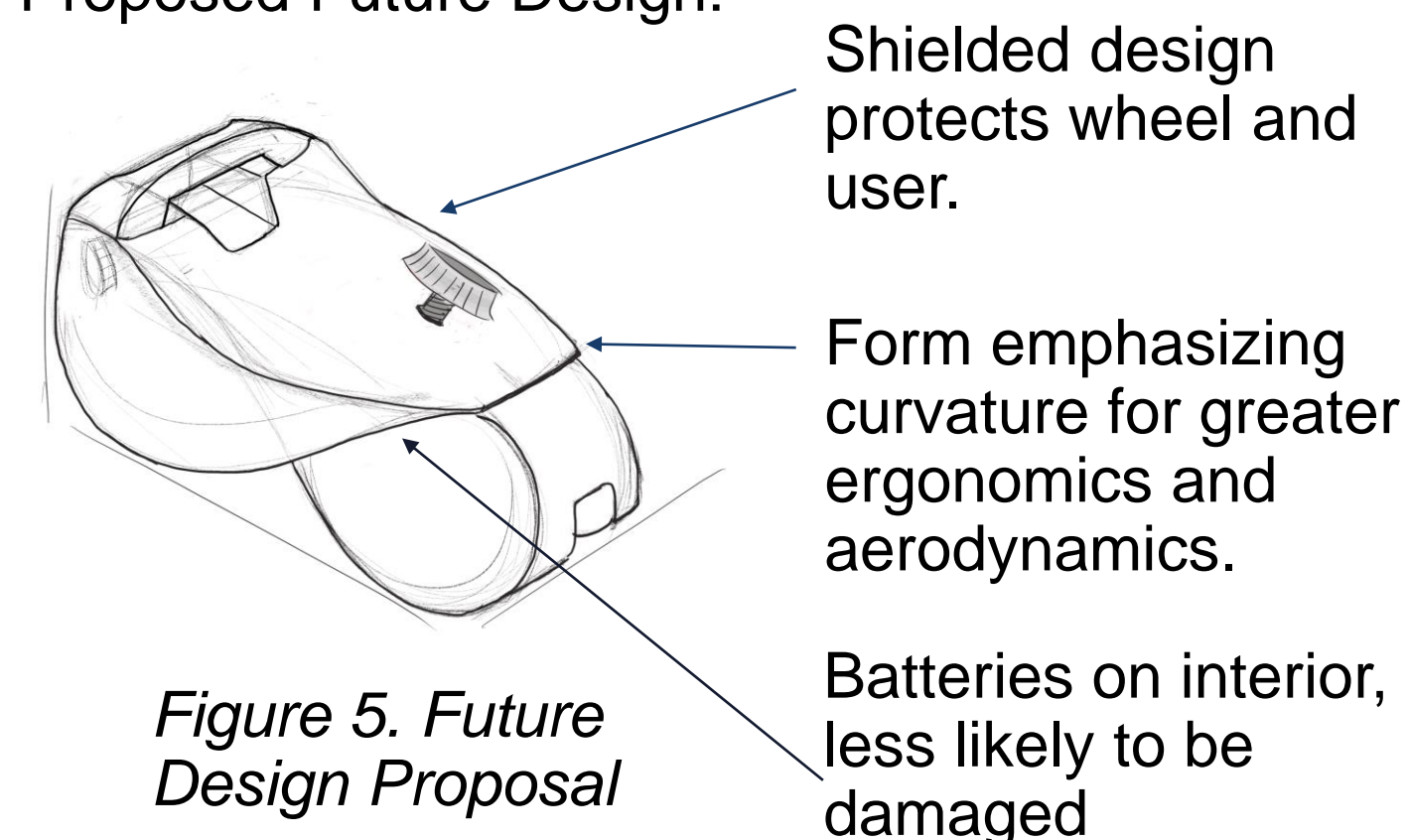
Proposed Future Design:

Shielded design protects wheel and user.

Form emphasizing curvature for greater ergonomics and aerodynamics.

Batteries on interior, less likely to be damaged

Figure 5. Future Design Proposal

References:
1 . https://www.santandercycles.co.uk/london

Key Features

Three Step Attachment Method:

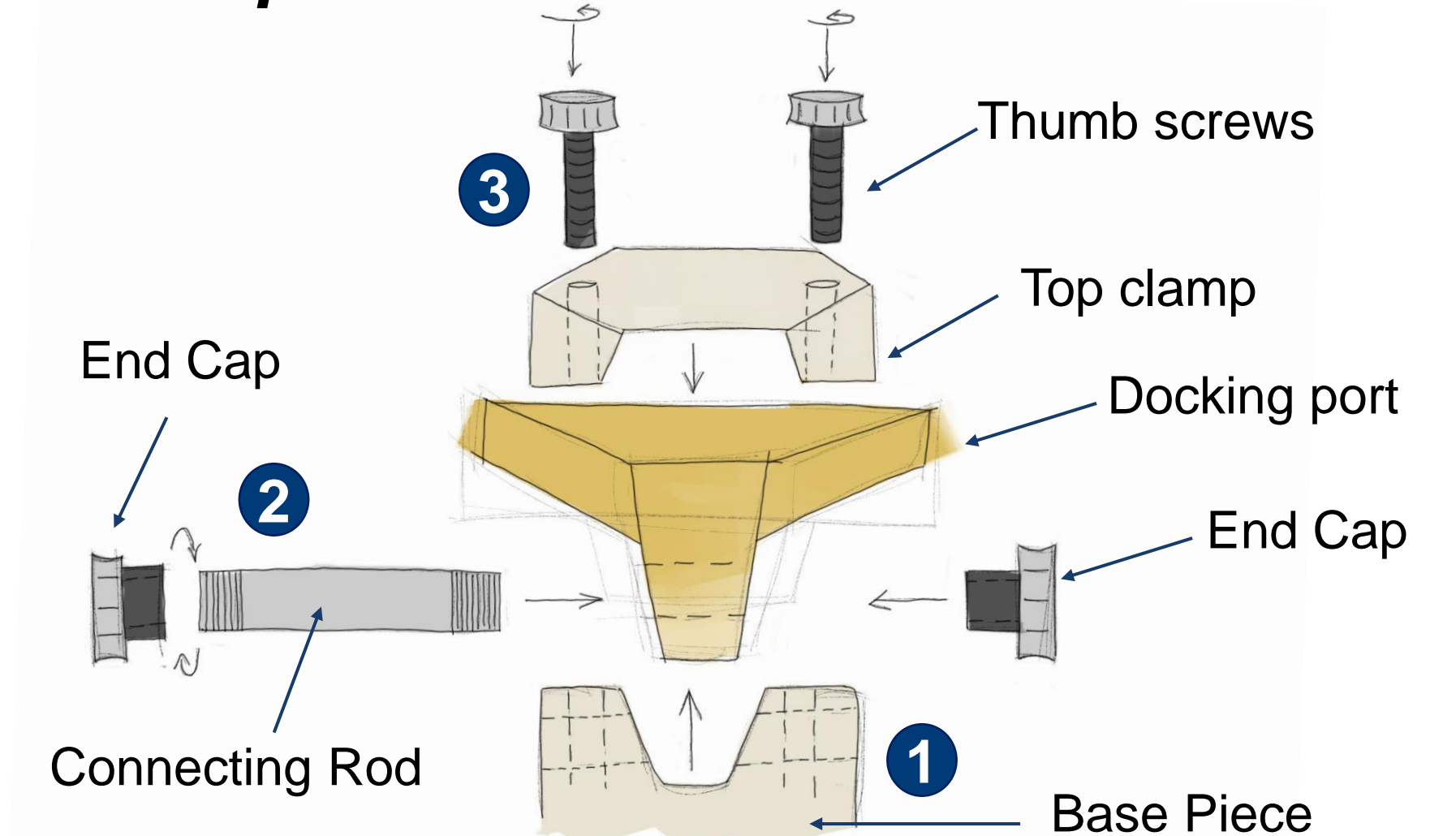Thumb screws — Top clamp — Docking port — End Cap — Base Piece — Connecting Rod — End Cap

Figure 3. Diagram of attachment method.

1. Put base plate around docking port
2. Insert connecting rod and tighten end caps.
3. Tighten clamp piece around docking port with thumb screws.

Adjustment Mechanism:

Drive-wheel position is adjustable to fit all tyre diameters

Tightening pushes wheel down, loosening pushes wheel up.

Pivot Hinge — Threaded knob — Fixed Plate — Drive wheel — Threaded Adjustment Rod — Transmission Casing — 1 degree of freedom system (azimuthal direction).
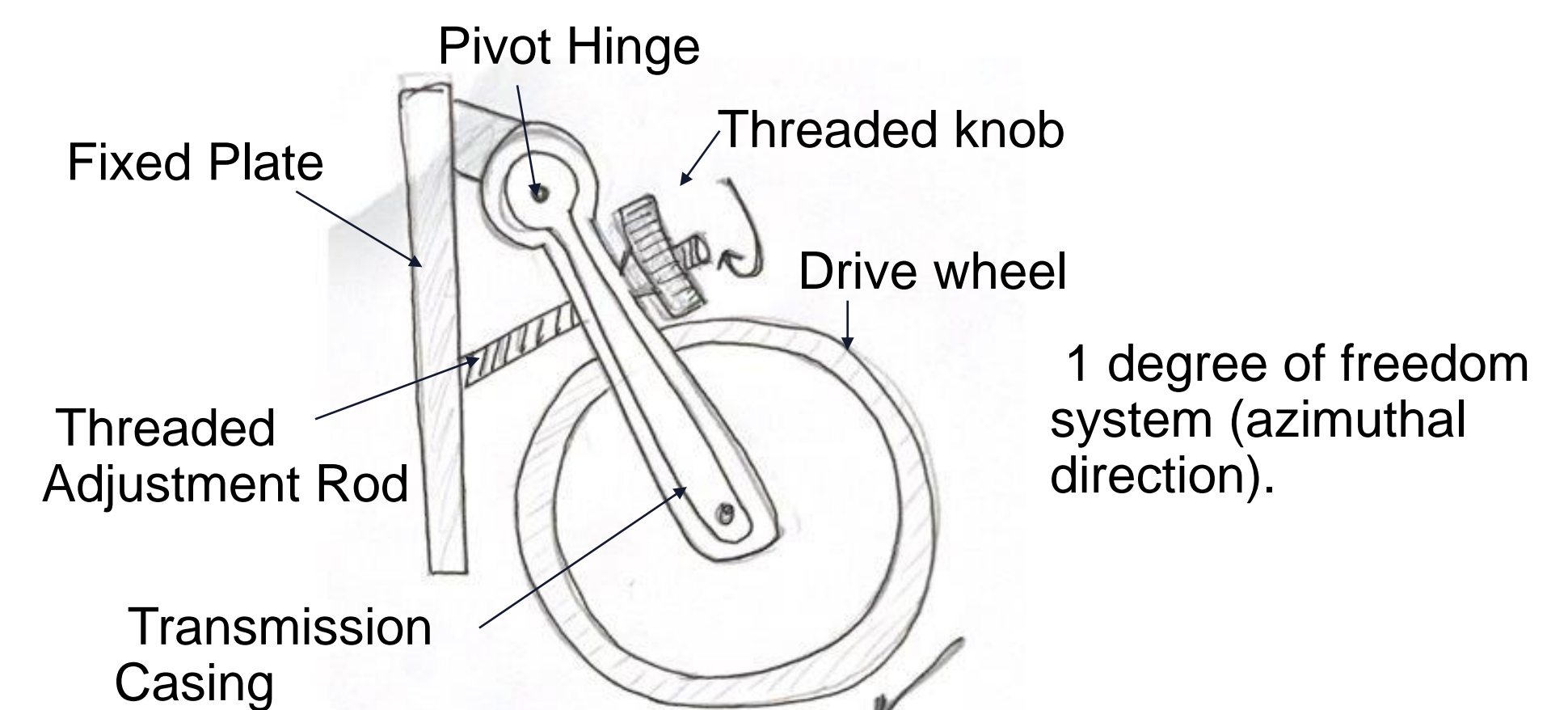
Figure 4. Side View Diagram of adjustment method