Adaptive Fishing Rod and Reel for Disabled Individuals

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Abstract

Team 6 has proposed, developed, and produced a proof-of concept prototype for a novel adaptive fishing rod and reel retrofit device that allows persons of varied degrees of disability to participate in sportfishing in a manner that is congruent with their normally abled peers. Bait casting style fishing reels and rods are a mainstay within fishing arsenals of many individuals in North America. Due to their inherent construction, they are unwieldy, or at times, impossible for differently abled fisherman to use as their design hinges on two-handed operation. In response, a retrofit device was created such that people experiencing total inability to use one hand and/or arm may now use bait casting equipment in a manner that emulates the experience had by those with full use of both hands and arms.

Introduction

The team underwent experimentation to set appropriate human input parameters and subsequent output power needs. Advanced electrical power storage devices and motors were sourced to provide a modular device that is the first of such devices to provide variable speed retrieve capabilities to the user. Likewise, electrical, and mechanical design features allow the user to operate the device while utilizing all the features of the fishing rod and reel in a safe and ergonomic manner.

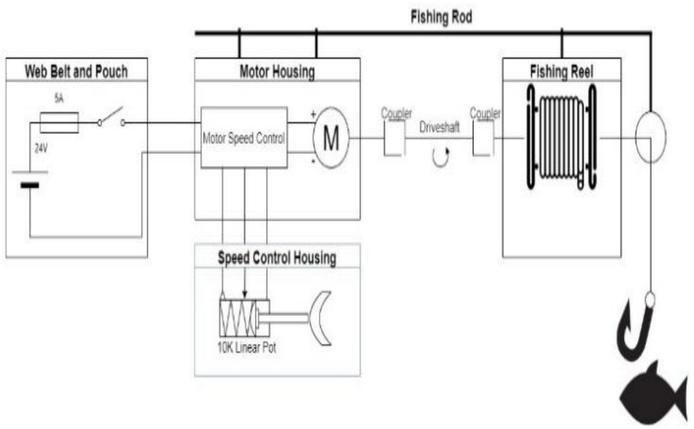

Fig 1. High Level Block Diagram

Methods and Materials

A. Brushless motor

There were two necessary tests to determine motor specs. The first test was testing the torque need to engage the fishing reel drag. Testing the fishing reel drag was done by using a torque wrench and reading the value at where the torque wrench would engage the drag setting. The result was 2.71 Nm, and this torque was used to narrow done the motor selection. The second test was done to find an equivalent rpm that a normal user could perform on the reel. Measuring reel speed was measured by counting the revolutions as the wheel was spun by hand. The average speed result from the test was 170 revolutions per minute. After the tests were performed, we narrowed down the motor selection to a brushless DC motor (Fig 3) that would be able to hit the desired specification such as 2.7Nm and have at max rpm of 200.

B. Pontentiometer

The placement of the in-circuit potentiometer was problematic, and the style of potentiometer was not ideal for fishing. The team was able to find an equivalent potentiometer that was in a style of a spring-loaded plunger that was attached to the board via external cables. This was ideal because it would allow for the potentiometer to be placed in a more ideal position and create a trigger system that when let go, it would turn off the motor.

C. Flexible drive shaft

The team went with a DeWalt flexible drive shaft since the drive shaft has the moving components enclosed, this allows to minimize danger to a user.

D. Couplers

The team decided to go with two aluminum set screws couplers. One of the couplers was treaded to attach to the fishing rod handle screw was.

E. Batteries and safety switch

We selected a 24v, 4 Amp hour battery. This battery was able to match the motor specifications. To attach to the motor, we used an adapter that would convert the three prong leads from the battery into just a two lead that would simply attach into the motor. During construction, the team notice a potential hazard with the battery, and it was decided to add a switch that would be able to power off the board while switching batteries. This switch was attached with a fuse that would protect the board from potential short circuits.

F. Battery Pouch

The team was able to find a military style belt pouch and belt (Fig 2) that would allow the user to insert two batteries in it and to rest the fishing rod on top of the pouch while in operation.

G. Case

3D printed case was designed and printed that allowed for a friction fitted motor and a retrofitted rod that was secured with a house clamp.

Fig 2. Battery Pouch and Belt

Results

The Adaptive Fishing Rod and Reel for Disabled Individuals successfully pulled a weight of 5lbs over 50 yards. The device's design successfully incorporated a variable speed retrieval system, which is the first incorporated in this type of product. Design and construction of the device lends itself to easy use as it properly orients the user's hand to the device. Along with successful testing of the prototype, the parts making up the assembly are low cost and easily sourced.

Discussion

Once the prototype was complete, the Adaptive Fishing Rod and Reel for Disabled Persons successfully pulled a weight of 5lbs over 50 yards. In addition to the load test, the reel spun at max speed of 160 RPMs for 5 minutes. Along with the successful testing of the prototype, the parts making up the assembly are low cost and easily sourced.

Fig 3. Interior of Brushless DC Motor w/Transistors

Conclusions

This prototype suffices as proof that advanced, electric motors and respective control circuitry are economically available, off-the-shelf battery options are easily procured, and capable technologies exist to produce the mechanical drivetrain parts and covers to facilitate a venture to produce this product within the sportfishing marketspace.

Upon initial design and assembly, it is apparent that the product could be produced a price point that is both economically advantageous for a company operating within the fishing market and could be provided to the consumer at a price point that allows for a great deal of inclusion for the target population. Furthermore, the adaptive fishing rod and reel retrofit device would allow far greater inclusion of individuals within these sportfishing communities and provide recreational and therapeutic opportunities not currently available to several hundred thousand differently abled people.

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