

INNOVATION OF YIJATOYS SWIMMING PENGUIN

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Reon Samuel

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Instructor: Crystal Rodwell

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Introduction

When children play with toys, it helps them develop their motor skills while stimulating their curiosity, creativity, and imagination. Some may see toys as only play instruments, but toys can also be an educational instrument used for childhood development. Toys have been around for a long time, with records dating back to 2600BCE (McMhon, n.d.). For example, these old toys were simple clay animals, wheels, and wooden dolls, having minimal depth or details. As technology and materials improved, so did the design and durability of the toys; one such example is the rubber duck created by Charles Goodyear in the latter half of the the1800s. Being the first waterproof toy, it was designed solely as a solid chew toy for dogs and babies. Manufactured by Goodyear to demonstrate his vulcanization process, i.e., making the rubber moldable.

A century later, in the 1900s, Leo Baekeland invented plastic, revolutionizing the toy manufacturing industry. Now designers had a material that not only could be molded but was also structurally rigid and had excellent insulating properties. This innovation Permitted Joshua Lionel Cowen, a toy inventor, in 1901 to incorporate electrical components into his trains, creating the first battery-powered moving train. Furthermore, in 1937 Walt Disney redesigned the initial rubber ducky, allowing it to be buoyant in water, a design change brought about by parents needing to lure their children into taking baths. Incorporating the idea of child's play in the tub, the toy manufacturer YIJATOYS designed a swimming penguin. Improvements in waterproof technology allow it to remain buoyant yet partially submerged in water. Along with its waterproofing technology, the toy also integrates battery power electrical components that propel it through the water.

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Description

Parts and Subparts

The analysis of the YIJATOYS swimming penguin will be done from the inside out, from the rear of the toy to the front. The swimming penguin is a toy that consists of three main parts and eight subparts. The main parts are the outer shell divided in two, a propeller and, a miniature baby penguin, as seen in image 1. The subparts consist of: a motor, motor housing, five self-tapping screws, two AAA batteries, battery housing, two rubber O rings, magnet, and magnet housing, see image 2.

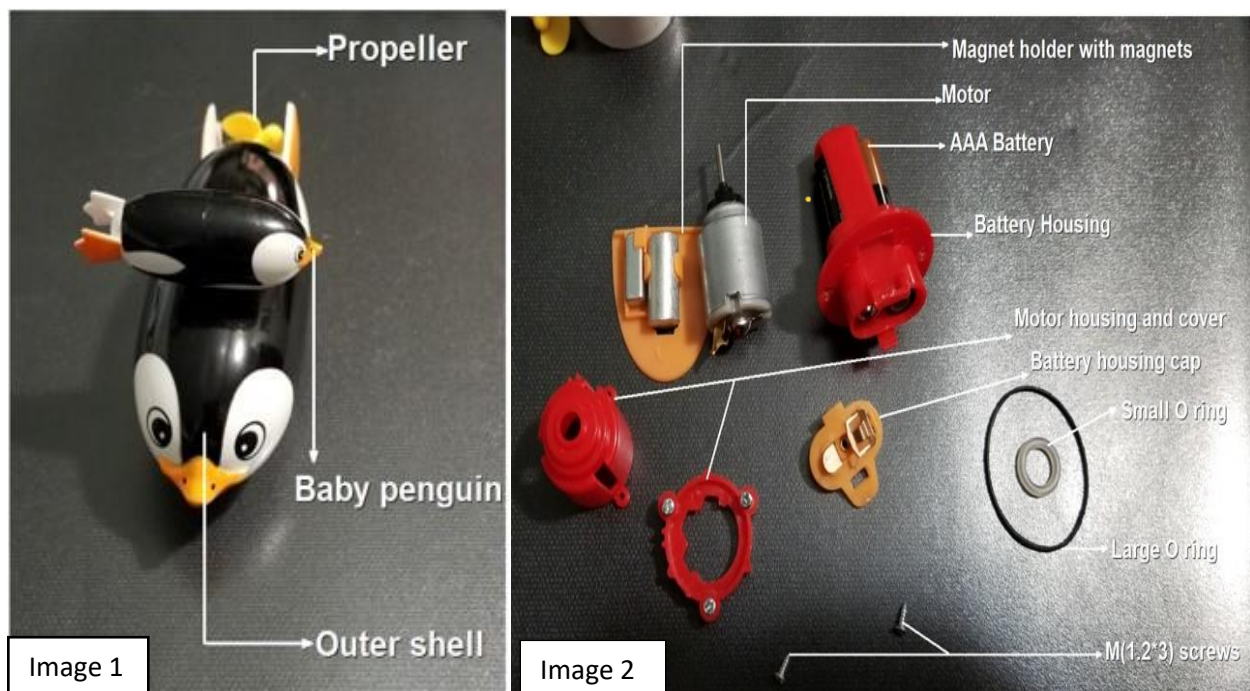


Image 1: Showing the main parts of the swimming penguin.

Image 2: Subparts of the swimming penguin.

Motor

The main driving component of the swimming penguin is a 3volt motor capable of generating 0.75W of power, ample power needed to propel the toy through the water. It is dull gray and cylindrical in shape with a white plastic switch at the back and a chromium shaft protruding through its front, as seen in image 3. The dimensions of the motor are 2.8cm x 2.5cm, the shaft of the motor is 0.7cm with a diameter of 0.25cm.

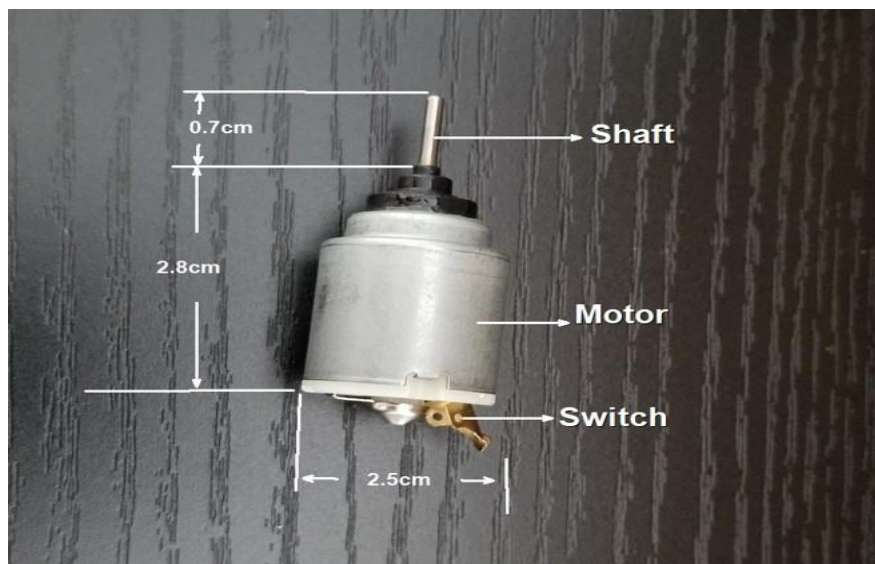


Image 3: Showing the dimensions and parts of the motor used in the swimming penguin.

Motor housing

The motor is housed in a red hollowed-out cylinder with three rectangular holes on the side and a red cap that snaps on to keep the motor secure, as seen in image 4. The motor housing dimension are 3.0cm x 2.7cm, with rectangular slots of 0.4cm x 0.7cm. These slots prevent the motor from overheating when the toy is in use, as the motor converts the chemical energy from the battery to rotate its' shaft. The housing cap is an open circle with an outer diameter of 2.7cm,

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constructed with three holes along its edge, each located one-third the distance around its' circumference.

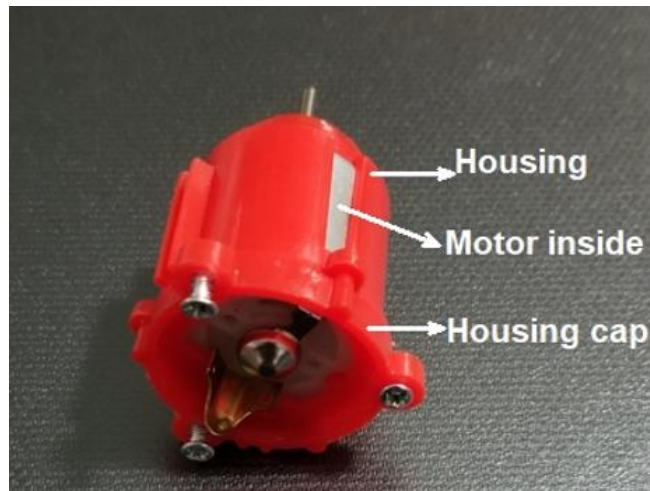


Image 4: Showing motor in housing with cap already in place.

Small O ring

A frosted rubber O ring with a diameter of 12mm*2mm attaches to the motor housing where the motor's shaft protrudes, as seen in image 5. The ingenious use of an O ring at this location acts as a barrier, preventing water from entering the back half of the shell, where the motor shaft projects out. In addition to waterproofing, the O ring also acts as a trap keeping a pocket of air inside the toy, which is imperative to keep the toy buoyant. The O ring is held in place with three self-tapping screws of metric dimension M(1.2*3)mm, which firmly secure the motor assembly to the rear outer shell, as seen in image 6.

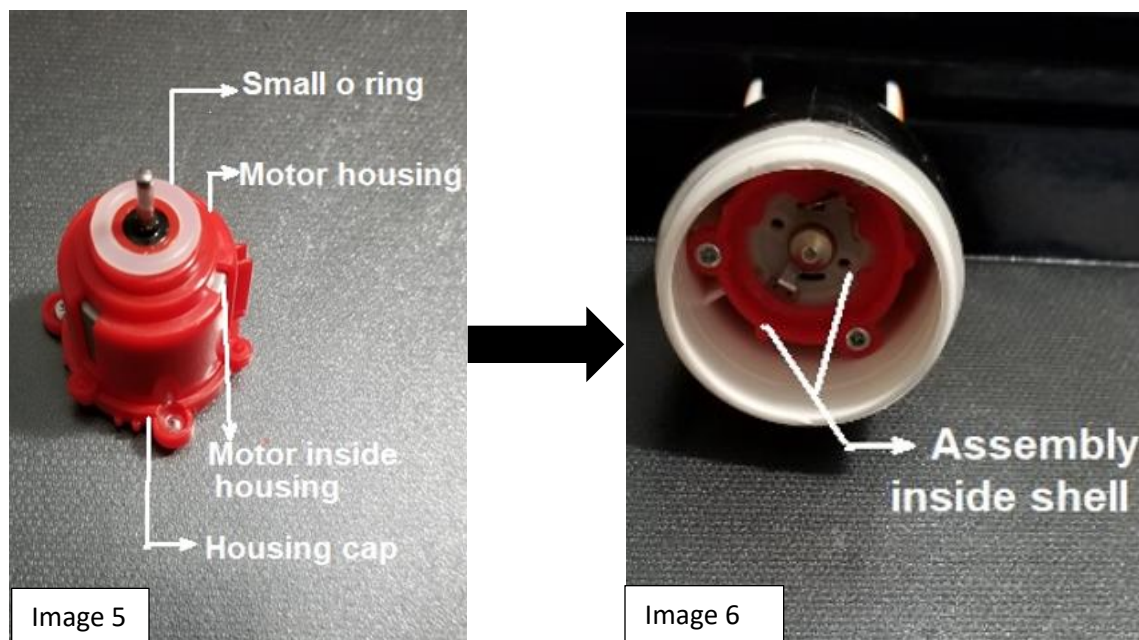


Image 5: Showing motor assembly with O ring. **Image 6:** Displaying motor assembly inside the rear outer shell.

The rear outer shell of the penguin is parabolic in shape; it is 6.60cm long and has a diameter of 4cm with a tuxedo suit pattern of the lower half of a penguin, see image 7. The open end of the shell has a groove with a slightly reduced diameter of 3.85cm that allows the black O ring of a diameter of 3.9cm to fit snugly. The O ring seals the union of the outer shell's two halves, preventing any water from entering the toy. At the stern of the rear outer shell extends two elongated structures, which are 2.5cm apart, orange in color, and pointed at their ends. Between the two structures, the propellor, yellow in color, slides onto the shaft of the motor, firmly uniting to become one. While in motion, the propellor converts the rotational energy of the shaft to propulsion, propelling the penguin through the water.

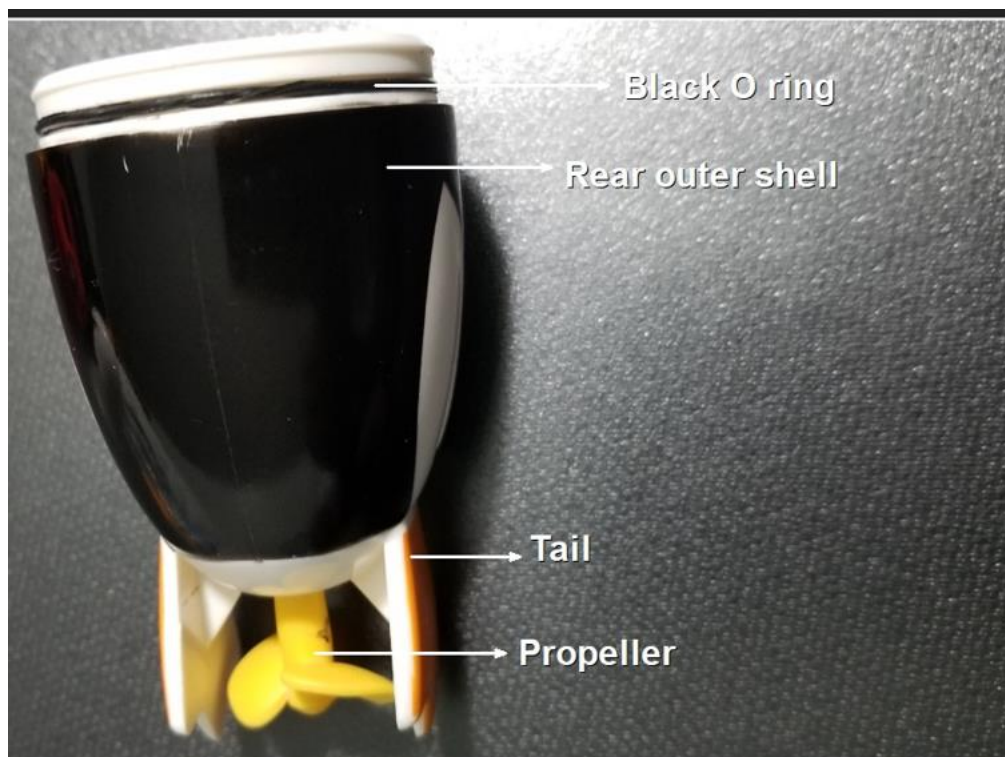


Image 7: Showing the rear outer shell and its fully assembled pieces.

Magnets and Battery housing

In the front half of the toy, the magnets are found on a thin semi-oval plastic plate dull orange in color, with a radius of 2cm. One magnet is rectangular, while the other is cylindrical and sits securely on the plastic disk found behind the battery housing in the outer shell of the penguin. The battery housing is red, rectangular in shape, and it has a yellow color cap. The battery housing is 5.4cm in length, including the cap with a width of 2.5cm, and is used to secure two AAA batteries which provide the toy with electrical power. The battery housing cap secures the battery in its' housing while simultaneously acting as a switch. It transfers the electrical energy from the battery to the motor via its brilliant twist switch design. Turning the toy on or off by twisting the shell in the opposite direction avoids the need for a regular click switch on the toy's body, which can compromise its waterproof technology. The battery housing is kept firmly

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secure in the front half outer shell of the toy with the remaining two M(1.2*3) screws; see image 8.

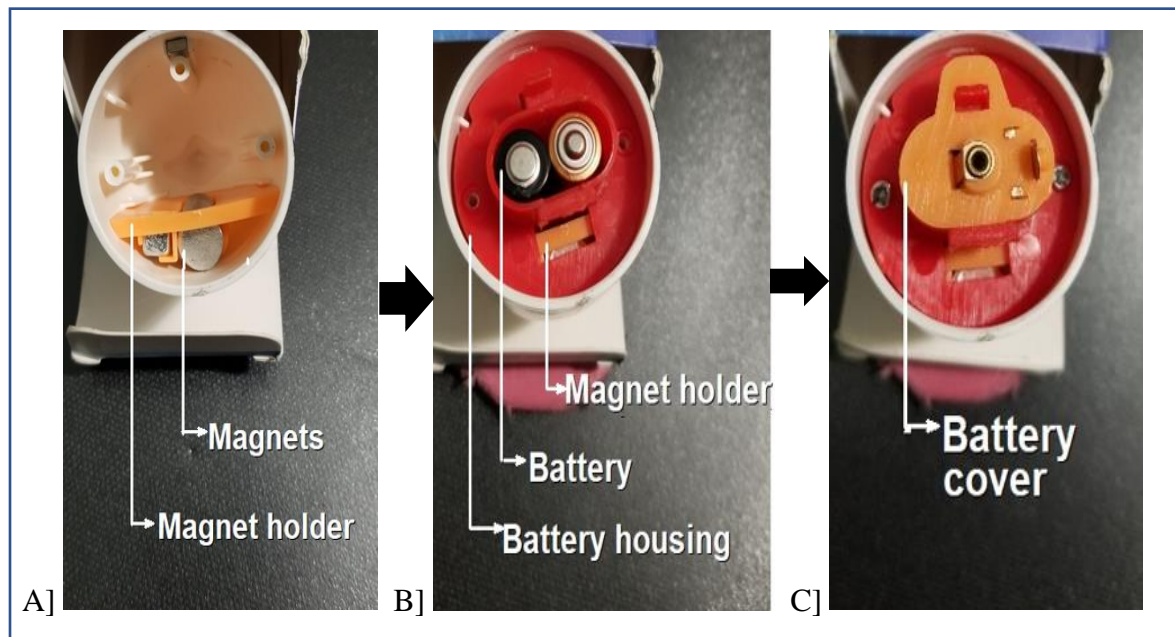


Image 8: Showing assembly of the front half of the toy.

Outer shell and Baby penguin

The front half outer shell is also parabolic in shape with a design that mimics the top half of a penguin of length 5.8cm and a diameter of 4cm; it consists of a beak at its front of width 1.5cm orange in color. When the two halves are connected, depicted in fig 1, it forms the streamlined shape of a bullet which reduces the effect of drag force that pushes against the shell of the toy as it travels through the water. The beak dissipates the water in front of the body by effectively creating an umbrella, shielding it from any further resistive forces caused by the water. The streamlined design prevents the motor from overheating by reducing the energy needed to glide through the water. The baby penguin attaches to the outer shell of the penguin, where the magnets are located to keep the toy straight when in motion. The use of the baby

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penguin acts as a stabilizing device preventing the toy from corkscrewing through the water as it swims due to the rotational or turning force caused by the propellor.

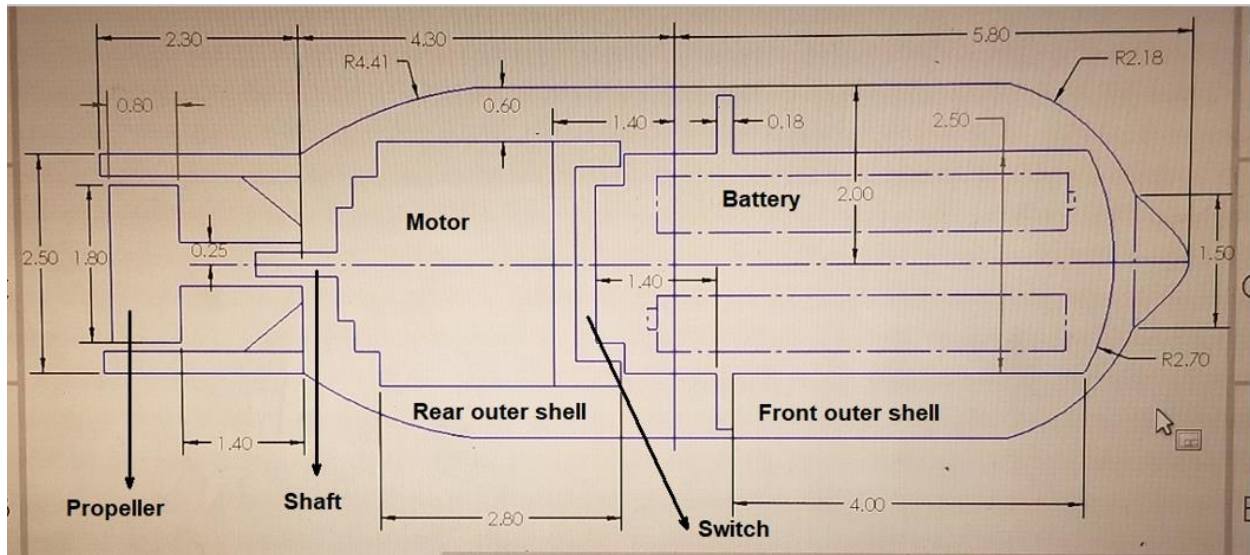


Fig 1: Showing inside view of the penguin when connected and dimensions are given in cm.

Conclusion

The YIJATOYS swimming penguin is a toy filled with many innovations and design that makes it suitable for families with children to have fun while taking a bath or swimming in the pool. The toy manufactures skillful improvement of waterproofing technology into the modern era using O rings, allowing the toy to keep out water without being entirely made of rubber, giving it structural rigidity. While at the same time shielding its electrical component allowing for safe use in water. With its aerodynamic design, the toy effortlessly glides through the water prolonging its operation time. The use of the baby penguin designers hints at family bonding. While at the same time, avoid the use of side fins which can cause injuries if the toy scrapes against the body, further making it child friendly.

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