Redesign of the Waterproof Lid on the Airboat

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Introduction

- Problem:

The current waterproof lid on the boat, which consists of 10 sets of wingnuts and studs, is time-consuming to use during tests in real environments and some other conditions

- Purpose:

To redesign the waterproof lid on the boat to make it easier to use than the current design

- Application:

Enclosure devices for electronic equipment usable in aqueous environment

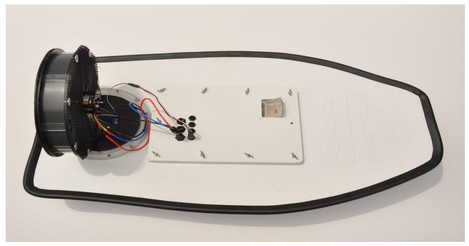

Figure 1. Current device on the boat

Approach

- Original approach

Structure inspired by the traytable attached to seats on the airplane, which is called “rotary block” here for reference.

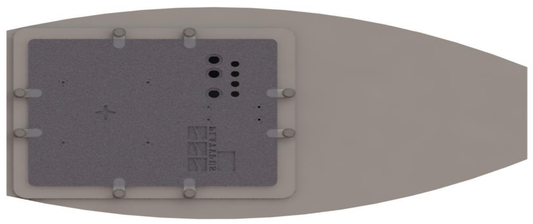

Figure 2. Solid model of the original approach

- Variant 1

A combination of rotary block and horizontal toggle clamp, which provides larger normal pressure on the central plate

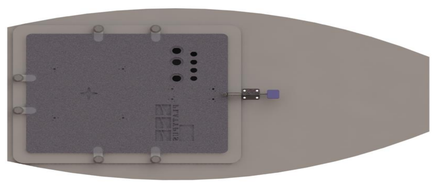

Figure 3. Solid model of the variant 1

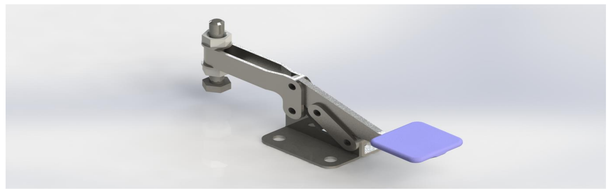

Figure 4. Solid model of the horizontal clamp

- Variant 2

Slot structure added which is inspired by the mechanism of the back cover of waterproof cell phones

- Other components that can be added

Hinges

Magnets assembled into the boat to provide extra pressure on the plate

A side device on the boat to grip the lid when it is taken out

Results

Simulation Results

- Pressure distribution is uniform enough to meet the requirement.

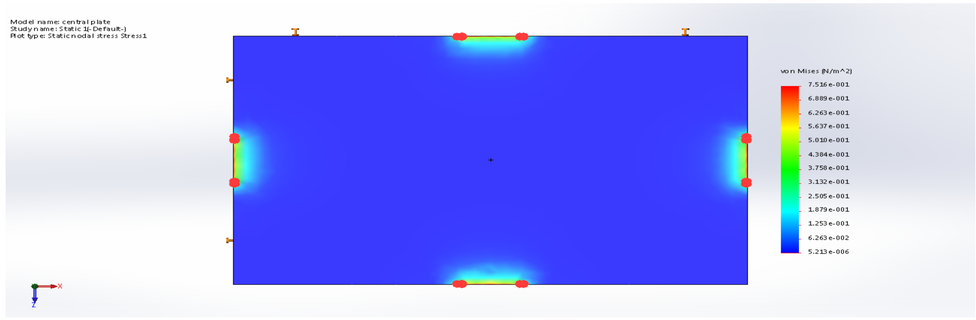

Figure 5. Simulation of the pressure distribution

Experiment Results

- Experimental device

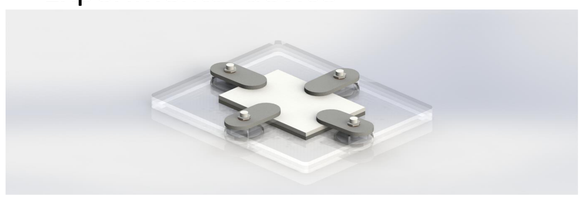

Figure 6. Solid model of the experimental device type 1

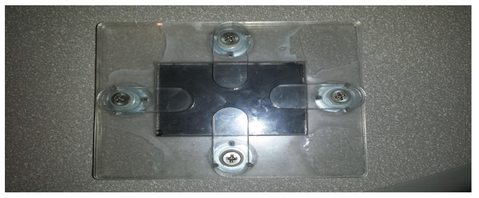

Figure 7. Hardware of the experimental device

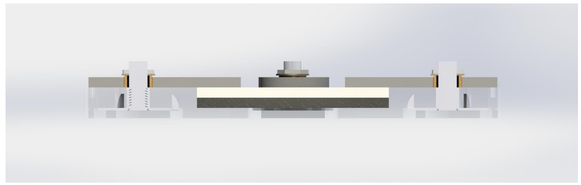

Figure 8. Section view of the experimental device

Tnut-screw structure can also be replaced by the ordinary bolt-nut structure or threaded holes

- Comparison with the current device

	Action required	Time consumed
Experimental device	Turn 4 rotary blocks	8.5 seconds
Current device	Screw 10 wingnuts	120.0 seconds

Note: Assumption made here is that the variance between time consumed by people with different levels of proficiency to complete the operation can be ignored.

Future Work

Future work may include:

- Make prototypes of variant 1 and 2 and compare the three methods to finally determine which one to adopt
- Refine the experimental device to make it work on real boats
- Combine hinges or the side device

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