BUOY DESIGN

Vladivostok, Russia

2022

The principle of the float

To perform profiling of and measuring water parameters at different depths, we create the buoy that automatically dive and float a speed of 0.4 meters per second. The movement of the buoy is due to a change in the volume of the Lift Bag thanks to the built-in pump and valve. The compressor sucks air from the internal volume into the external chamber(balloon), the volume of the body increases, and hence the volume of the displaced fluid, which increases the pushing force. With the help of the valve, the exhausted air remains in the ball and the float floats up. The buoy is designed so that when excessive pressure occurs, the plugs come out of the coupling, they are not fixed and lubricated with silicone for greater mobility and tightness.

Frame

Figure 1. Repair coupling

Repair coupling at 50 mm repair sleeve was chosen as the hull, since this is the shape of the size we need (too large floats would be difficult to grab with a manipulator). The coupling has rubber gaskets and plugs that can be freely opened.

- *Diameter = 50 millimeters*
- *Height* =105 millimeters

Air pumping mechanism

As mentioned above, the compressor pumps out air, which, thanks to the valve, remains in the balloon. After that, buoy operation is activated using a reed relay with a power key, the valve switches and releases air back. For power, we used AAA batteries 1.5V. All slots were covered with epoxy resin to reduce air loss and keep internal components from moisture.

Figure 2. Air Pump

Figure 3. Mixer & Air Valve

Figure 4. Batteries

Electronics:

For the automatic operation of the Buoy an Arduino Nano controller is used, which is programmed to issue signals on the pump and Lift. MOSFET transistors are used as power switches. The electronics unit is activated when a magnet is brought to the reed relay.

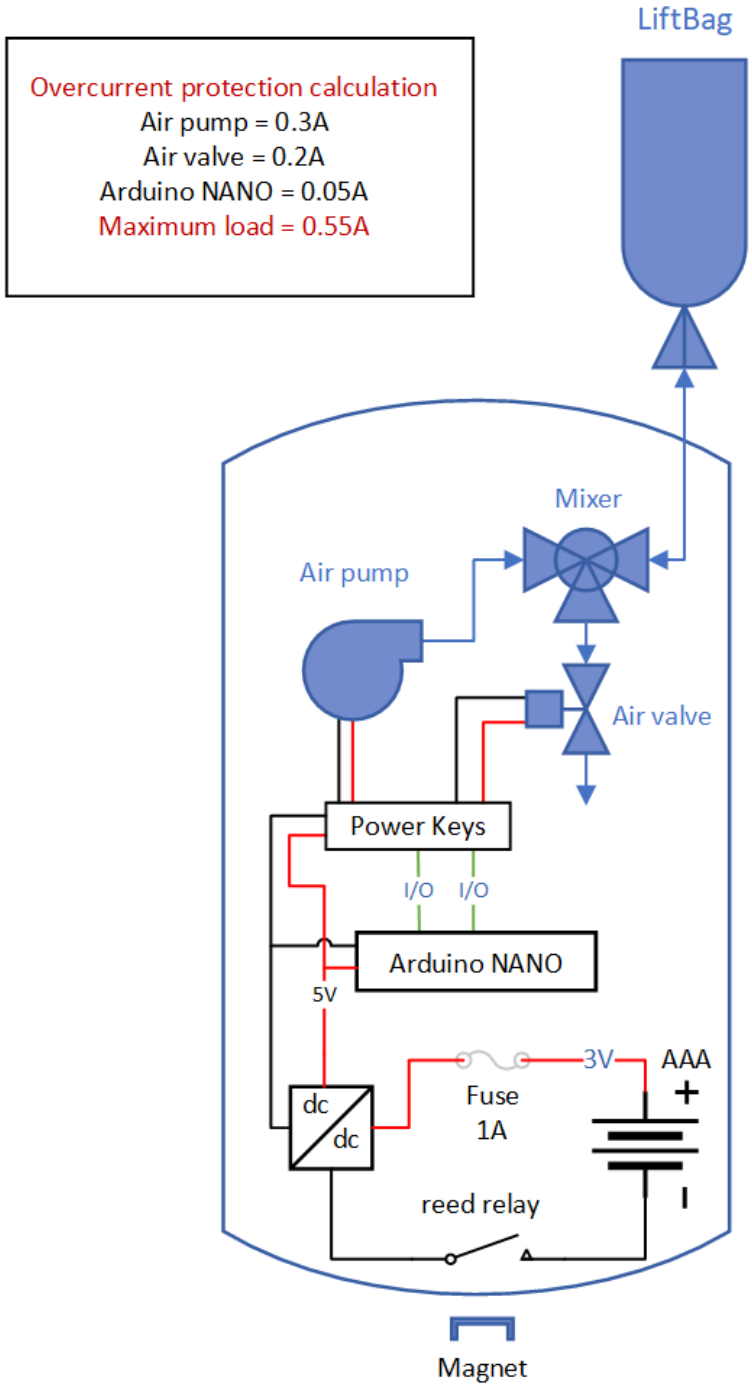

Figure 5. SID Buoy

AAA batteries are fixed with adhesive tape.

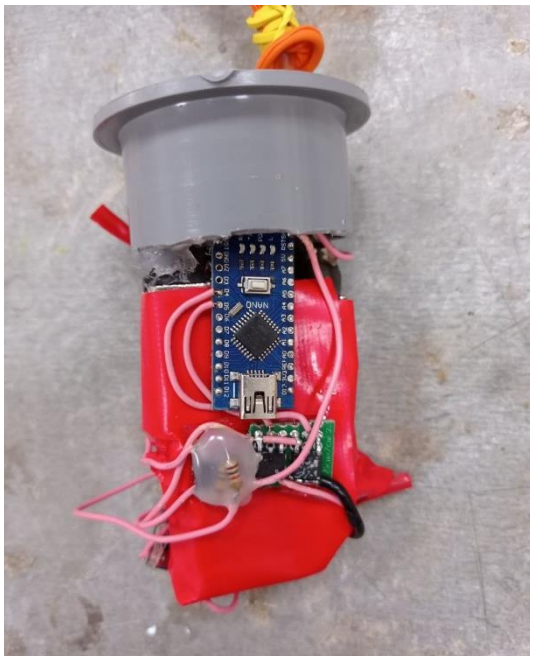

Figure 6. Assembled device

Tests

After assembly, making sure that the mechanism works, test dives began. We filled our aquarium and placed the float in it. As it turned out, even without an inflated balloon, the float was kept on the surface of the water. To solve this problem, a piece of lead was glued to the float, which already pulled it to the bottom, but did not allow it to float when the balloon was inflated.

Experimentally, the optimal lead weight was selected, with which the hit sinks and floats when the ball is inflated.

Figure 7. Float buoy

Figure 8. The buoy is sinking

Pool tests

During test dives, the float was able to emerge from a depth of 1.5 meters. At a depth of 4 meters, the compressor power was not enough to inflate the balloon enough to ascend. After that, the buoyancy and initial pressure conditions were corrected. as a result, the Fight began to float from the bottom of the pool.

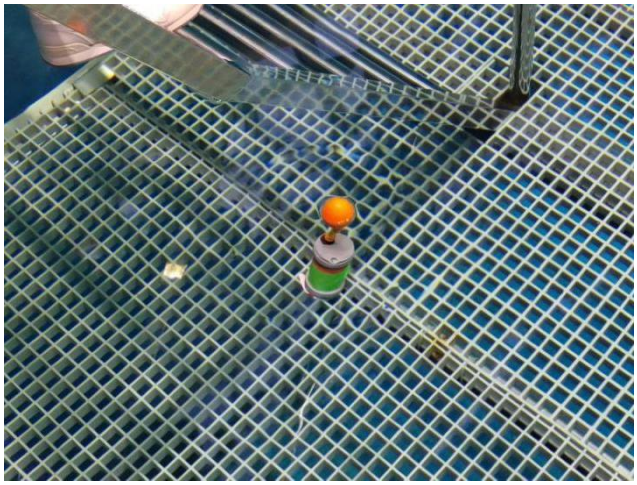

Figure 9. Buoy on the surface in the pool

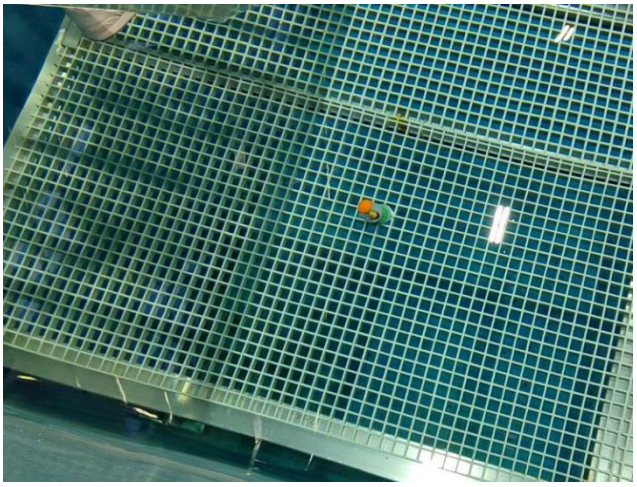

Figure 10. Buoy at the bottom of the pool