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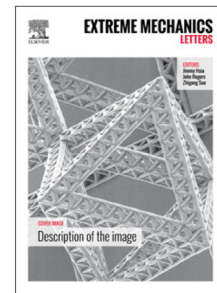
A passive mechanical system for moving against fluid flow

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Always the extraordinary phenomena are interesting for everybody. Sometimes a simple idea can leads to amazing results. Here, we will consider the special case of the interaction of the fluid flow and a propeller. Usually, the interaction of the fluid flow and a propeller divided into the two categories. In the first category the rotation of a propeller generates a flow in the fluid and in the second category, the fluid flow rotates a propeller. The first is energy consuming and the second one is energy generating. In some special conditions we can make a closed loop for generating and consuming the energy. In this paper I will offer a simple mechanical sketch for a device to move against the fluid flow direction without any external energy source. In fact by using some simple rules and principles of Newtonian mechanics, the suggested device can move against fluid flow direction using the energy of fluid itself. Such devices are important because of their capability for access to points, out of other types of energy, for example the end of deep and high flow rate wells such as oil and gas wells; or for design of any device to go forward and backward with same flow directions.

I. INTRODUCTION

The combination of the fluid flow and a propeller have a long history in the human life from Archimedes' era [1]-[8]. Sometimes we have used a propeller to catch the kinetic energy of the fluid flow for converting it to our intended kinds of energy (usually electricity); wind turbine [2], water [3], steam [4] and all other types of turbines [5] are useful energy catcher and converter even in our todays life. On the other hand we have turned a propeller in the fluid to create a flow for many types of popular applications such as propeller of ships and submarines [1, 6], airplanes [7, 8], fans and etc. Here I want to introduce a novel application of the fluid flow and a propeller combination. We want to catch some parts of the kinetic energy of the fluid flow by a device to move it against the fluid flow without any extra energy. In this case one may see that the fluid flow pull the device in an irregular manner rather than to push it. Anyone who is familiar with fundamental physics [9] can understand this paper. Up to my search in literature and publications, I couldn't find this idea and this is for the first time that this technique is proposed.

After an introduction to detail of device in Sec. II, I'll investigate the condition of device in the flow followed by its amazing results in Sec. III and a summary in Sec. IV.

II. DETAIL OF SKETCH

In this section I will introduce the main parts of device in detail. The main parts of device are propeller, gear box system, wheels and a cylindrical shell as the body of the device and the holder of all components (Figure 1). Consider a cylindrical thin shell as a main frame of the device. A propeller located inside cylindrical shell and can rotate around the principal axis of cylinder. A system of coordinate fixed with respect to the cylindrical body and x-axis coincident with the main axis of cylinder. The area of blades are $S = L_b \times W_b$ where L_b and W_b are the length and the width of blade respectively. This cylinder can move inside a pipe by eight wheels. Two of mutual wheels equipped with a gear. The mass of these two wheels are m_w and for simplicity, in our analysis we will assume that the mass of other parts are negligible with respect to m_w. Wheels are discs with momentum of inertia $I = \frac{1}{2}m_w R_w^2$ where R_w is the radius of wheel; and the position of gear's teeth on these wheels will assume as $R_{G6} \sim R_w$. Any forced torque on propeller can transform to equipped wheels with a gear box system. Equipped wheels are pushed to the inner body of pipe by the same springs. A fluid with density ρ and velocity v flows through the pipe. The fluid flows in the negative direction of x-axis and hits to all parts of device, specially the propeller.

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