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DESIGN AND DEVELOPMENT OF PROPULSION SYSTEMS WITHOUT TRACTION WHEELS, PROPELLERS, JETS, OR ROCKETS

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ABSTRACT

This article presents an innovative propulsion system tested up to now with vehicles with four but free wheels, that is, vehicles without traction wheels i.e. zero-wheel drive (0-WD). In this process the propulsion force does not depend on drag between tires and road, doesn´t require loss of mass, or any interaction with the environment. Design and experiments were progressively developed with different prototypes of small size due to economic and technical reasons. The most successful prototypes were built in 2011 and 2014, but other models have also been fundamental to demonstrate the operating principle. Future improvements are now under study aimed to design, building and testing improved and safer transportation means.

Keywords: momentum transmission, momentum conservation, zero-wheel drive (0-WD).

INTRODUCTION

Recent innovative propulsion systems depend on the mass thrown from the vehicle like in space ion thrusters, or by moving liquid with magnetohydrodynamics (Marco, 2016). Other solutions like Maglev explore linear actuactors (Laithwaite, 1975) and (Chang-WH, 2015). Other new propulsion systems are presented in (Millis, 2006), (Vartholomeos, 2008), and (Wane, 2009). There is no need for new laws of physics / mechanics to explain how it is produced thrust of a vehicle without traction wheels because locomotion of octopus, boats, aircrafts and rockets are all justified by the momentum conservation and transmission principles or, with action-reaction law.

The initial experiments carried out by the first author, begun with a wheelchair and then with a load cart, only demonstrated the possibility of moving these vehicles. The next step was a mechanized / motorized vehicle with four but free wheels. In early 2011 this first prototype 0-WD-2011 (Figure 1) demonstrated the ability to move the vehicle by using an electric motor instead of muscular effort or weight (used until Meccano-2010; see Table 1). In 2012 a larger vehicle was constructed having in the center the engine and an actuating mechanism. This mechanism could compress two gas springs on the one hand, or actuate a platform with a circular translation movement of the other side. The results were not satisfactory with springs, but the side similar to 0-WD-2011 confirmed the possibility of the author actuate the mechanism for moving the vehicle, due to the absence of an electric motor with power required. The lessons collected in experiments by 2012 were encouraging but challenging. The videos of the tests were observed patiently and in detail using Power Director. The main interest was to obtain a continuous motion of the vehicle, from a 0-WD rotational mechanism, therefore a new 0-WD process was designed in 2013, with its prototype built between July and October 2014, whose tests were conducted during November 2014.

RESULTS AND CONCLUSIONS

Figure 1 illustrates two 0-WD vehicles, in movement tests, all on flat surfaces with the usual irregularities in tables and workshop floor. Table 1 compares the main specifications of all prototypes and the results obtained in the tests.

Table 1 - Test results of Zero-WheeDrive (0-WD) vehicles in horizontal floor/flat surfaces

0-WD vehicle	Mass (kg)	Power (W)	Actuation	Speed (m/s)
Wheel chair-2009	85	-	muscular	N/A
Load cart-2009	100	-	muscular	N/A
Meccano-2010	4,3	-	weight	N/A
0-WD-2011	3,6	250	electric	0,034
0-WD-2012	125	-	muscular	N/A
0-WD-2014	18,3	620	electric	0,1

0-WD-2011 0-WD-2014

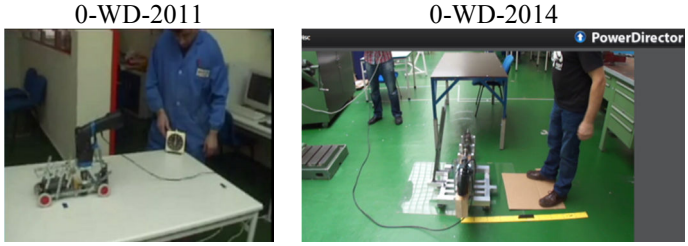

Fig. 1 - Two main configurations of the tested 0-WD vehicles

In order to improve system performance new developments are aimed to enable safe operation of these vehicles without wheel drive (0-WD) regardless of weather and road conditions, as well as, designing and testing of new applications to future boats, aircrafts, and spacecrafts.

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