Effect of Momentum Dismemberment on Linear Momentum

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ABSTRACT

Spacecraft can accelerate only for a few minutes, and must coast to their destination at a constant velocity for months or years. This limitation is in place because the spacecraft needs propellant for acceleration, and the amount of propellant available is always limited. I present a method of propulsion in micro-gravity without expelling mass (propellantless) therefore permitting constant acceleration for extended periods of time in order to obtain a very high velocity. The technique is based on a free floating mass assembly (RMA) contained in a pressurized structure attached to the spacecraft. The ram mass assembly(s) is propelled inside the pressurized structures by propellers (or jets of air or other fluids) in the "forward" direction gaining relative velocity and momentum, yet the air molecules expelled in the "backwards" direction continuously collided with surrounding air molecules randomizing their vector direction.

1. INTRODUCTION

We were all taught that to propel a closed system (spacecraft) without expelling mass/propellant is impossible, we were presented with many examples involving springs, levels, movement of mass or masses.

Most of the examples were graphically resented in ideal situations in airless environment, this paper demonstrates a method of propellantless propulsion that does not break (or bend) Newton's laws of motion, and is consistent with the kinetic theory of gases.

In a container, gas can be visualized as very small particles in constant movement, the "average" distances between said particles may be 40 times the "size" of the gas particle yet as they constantly move at very high velocity (dependent on the temperature) they are constantly colliding with one another.

The **Mean free path** of a molecule (average distance travelled by the molecule between two successive collisions) is the order of **0.1 µm**. (Micrometers = 1/1000000 of a meter

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2. METHOD PROPOSED

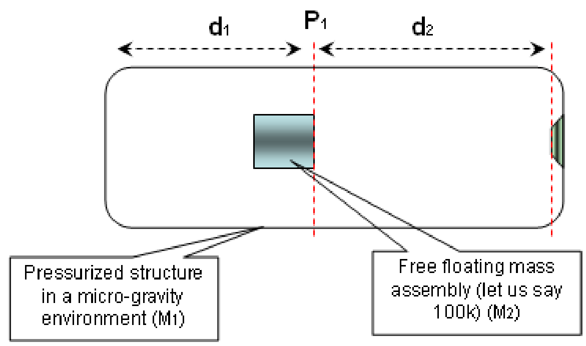

FIG 1

FIG 1 shows a pressurized structure (M1) (spacecraft) in space, inside the structure is a 100k mass (F2) that is traveling the same relative velocity, so to an external observer the mass (M2) is "floating" inside the structure (M1).

If we increment the velocity of M2 (100k) in the +X direction by 1 mps (meters/seconds), M2 will collide with the spacecraft's "forward" (or +X hull) at 1 mps creating a force of 100 Newton's, but we have been taught to believe that no matter what method (represented by "?" in Fig 2) we use to create a 100 Newton force in the +X direction a equal 100 Newton force will be create in the –X direction making useful propulsion impossible (FIG 2)

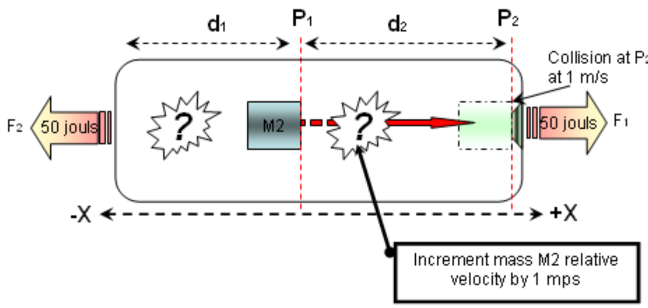

FIG 2

3. Interaction of compact objects in a closed system

We can accelerate the 100k mass (RMA) to 1 mps by various means.

Example 1: Pushing with a mechanical arm (fig 3a, 3b, 3c)
Example 2: Pushing with a spring (Fig 4a, 4b, 4c)
Example 3: Acceleration by expelling a steel ball (Fig 5a, 5b)
Example 4: Acceleration by expelling a series of steel balls (Fig 6a, 6b)
Example 5: (**Proposed method**) Acceleration by expelling air by propellers or air blower (Fig 11a, 11b)

We shall see that in examples 1 to 4 no propulsion is produced as the force that accelerates the 100k mass has an opposite force that is transmitted against the pressurized structure by the mechanism use to accelerate the 100k mass.

In example 5 we also have a force against the 100k mass, and an opposite and equal counterforce against the fluids (gas) molecules. The molecules are expelled in the –X direction by the opposite force but encounter and collide with the enclosed fluids molecules changing direction, and the momentum's vector direction tends to randomize and do not collides with the pressurized structures -X hull.

Example 1: Pushing with a mechanical arm (fig 3a, 3b, 3c)

Fig 3a illustrates a motorized arm assembly in position to push mass (M1) until it reaches a relative velocity of 1 mps.

In Fig 3b the arm assembly pushes mass (M2) in the +X direction changing its relative velocity from 0 to 1 mps in the +X direction transferring kinetic energy to the mass (M2).

As forces always occurs in pairs, the arm assembly pushes in the –X direction with a force of 100 newtons (F_2)

In Fig 3c the accelerated mass (M2) travels at a constant 1 mps till it collides with the pressurized structure's forward (+X) hull transferring 100 newtons of force (F_1) in the +X direction.

The complete cycle creates 100 Newtons of force (F_2) in the –X direction and 100 Newtons of force in the +X direction, no propulsion is generated.

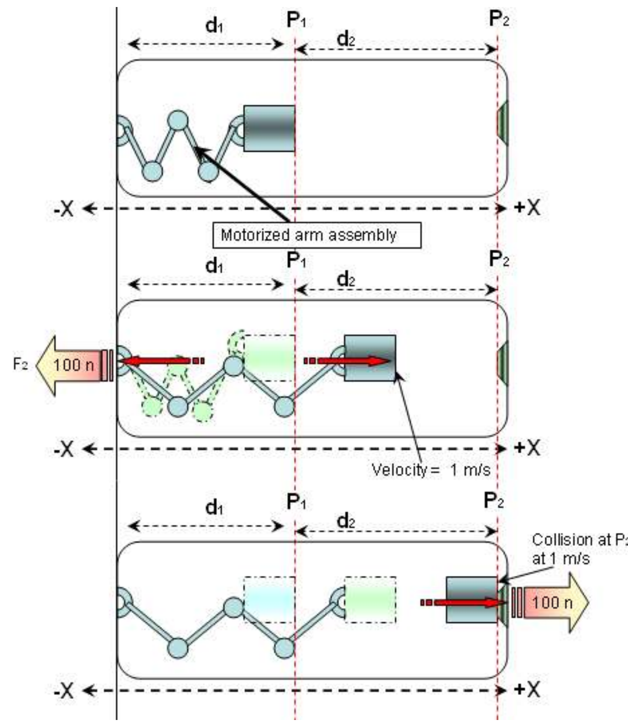

FIG 3

Example 2: Pushing with a spring (Fig 4a, 4b, 4c)

Fig 4a illustrates a coiled spring assembly in position to push mass (M1) until it reaches a relative velocity of 1 mps.

In fig 4b the released spring pushes mass (M1) in the +X direction changing its relative velocity form 0 to 1 mps in the +X direction transferring kinetic energy to the mass (M2).

As forces always occurs in pairs, the spring pushes in the –X direction with a force of 100 Newtons (F2)

In Fig 4c the accelerated mass (M2) travels at a constant 1 mps till it collides with the pressurized structures forward (+X) hull transferring 100 newtons of force in the +X direction.

The complete cycle creates 100 Newtons of force (F_1) in the –X direction and 100 Newtons of force (F_2) in the +X direction, no propulsion is generated.

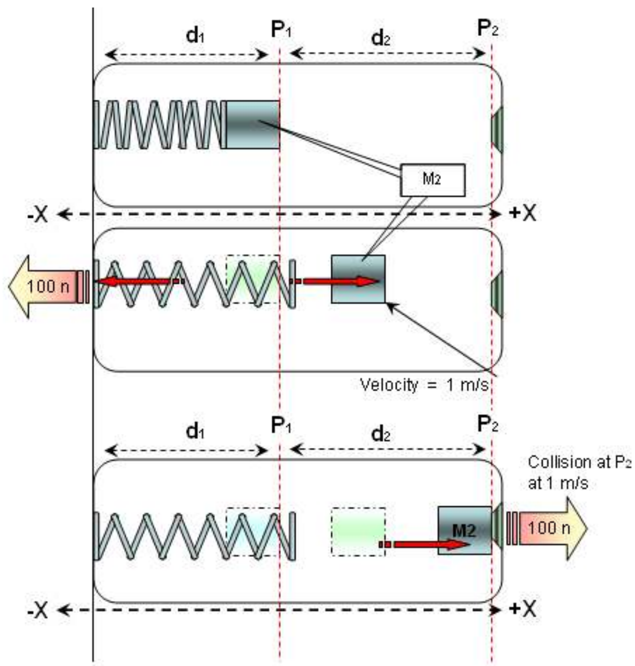

FIG 4

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Example 3: Acceleration by expelling a steel ball (Fig 5a, 5b)

Fig 5a illustrates the position of mass (M2) instants after it (M2) expels a steel ball with sufficient velocity so as to accelerate to 1 mps in the +X direction, the steel ball accelerates in the –X direction with a velocity of 10 mps

Fig 5b shows the instant of collision of mass (M2) against the pressurized structure's forward (+X) hull, transferring 100 newtons of force (F_1) in the +X direction.

The moment the steel ball collides against the pressurized structure's rear (-X) hull, 100 newtons of force (F_2) is transferred in the -X direction.

The complete cycle creates 100 Newtons of force (F_1) in the –X direction and 100 Newtons of force (F_1) in the +X direction, no propulsion is generated.

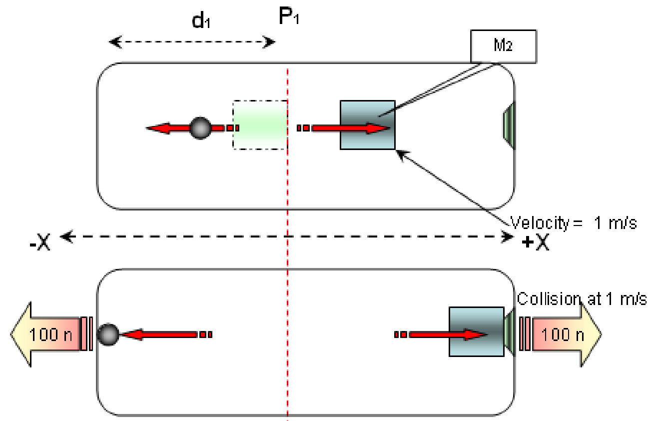


FIG 5

Example 4: Acceleration by expelling a series of steel balls (Fig 6a, 6b)

Fig 6a illustrates the position of mass (M2) instants after it (M2) expels a rapid series of 10 small steel balls (1k) with sufficient velocity so as to accelerate M1 to 1 mps in the +X direction, the steel balls accelerate in the –X direction , each individual steel ball has 10mps velocity

Fig 6b shows the instant of collision of mass (M2) against the pressurized structure's forward (+X) hull, transferring 100 newtons of force (F1) in the +X direction.

As the first small steel ball collides with the "rear" (-X) hull, it transfers 10 Newtons of force in the –X direction, as each steel ball collides with the –X hull a additional 10 Newtons of force in the –X direction is transferred.

When the last of the 10 steel balls collides with the –X hull a total of 100 Newtons is transferred.

If any of the steel balls do not reach the –X hull, the resulting force in the –X direction would not be equal to the 100 Newton force in the +X direction.

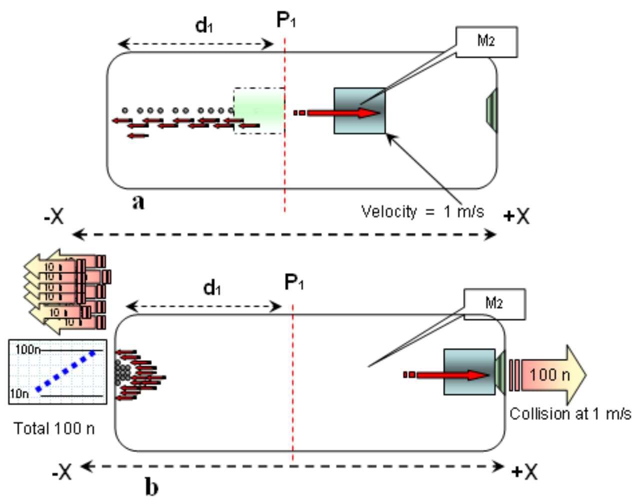


FIG 6

Example 5: (Proposed Method) Acceleration by expelling air by propellers or air blower. Part I (Fig 11a, 11b)

Examples 1 to 4 work just as well if the main structure (M1) contains a vacuum or is pressurized, for example 5 the main structure (spacecraft) must be pressurized with a suitable fluid (gas/air) for we accelerate mass (M2) with propellers (or blower).

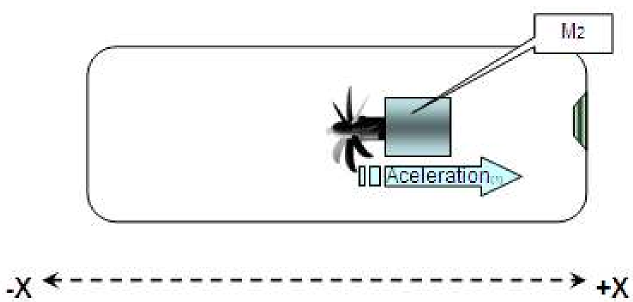


FIG 7

In fig 7 we illustrate that the RMA (M2) accelerates in the +X direction if the propellers generate a breeze in the –X direction.

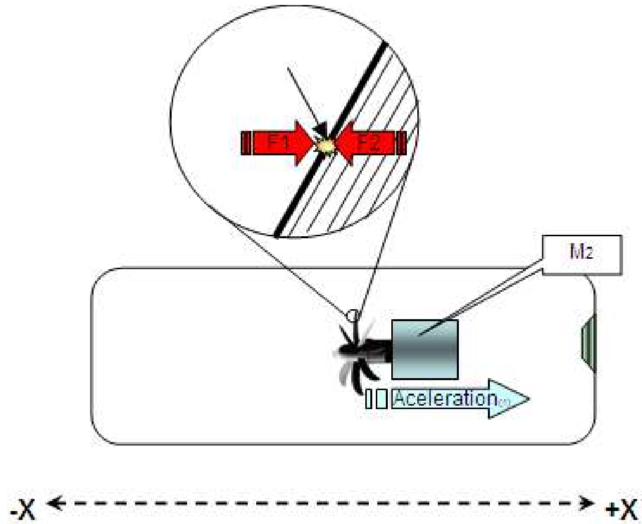


FIG 8

The forces that accelerate mass (M2) are created by the collision of air molecules against the propeller (Fig 8), for every force that pushes the propeller in the +X direction, an equal opposite force propels a gas molecule in the –X direction, we have a perfectly balances set of forces.

If the gas molecules propelled the –X direction behaved as tiny steel balls in a vacuum (fig 6) they would travel uninterrupted (FIG 10) transferring all their momentum against the pressurized structure's rear (-X) hull, (as in example 4), that would be equal to the momentum transferred against the +X hull by M2's collision.

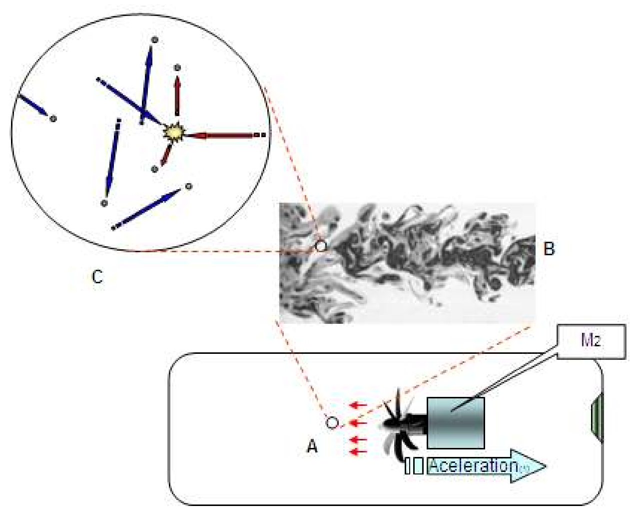


FIG 9

But as the molecules propelled in the –X direction by the propeller (red arrows in fig 9a) are elements of the fluid (gas), they interact (collide) changing the molecule's vector direction (Fig 9c), also the vector momentum is disassembled and redirected as the molecules interact with the turbulent flow generated by the propellers

4. Constant collisions of a gas molecule randomize and dismember its vector momentum

Fig 10 illustrates the ideal movement of a molecule that collides with the propeller, 2 momentum vectors M1 and M2 are created, if the propeller and molecule are in a vacuum, vector M2 will remain unchanged till collision

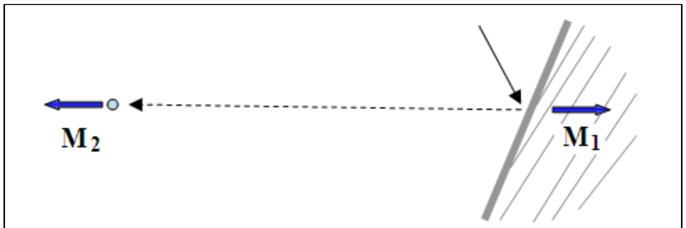


FIG 10

Fig 11a illustrates the resulting equal but opposite vector momentum M1 and M2 created by the collision of air molecule and propeller

In fig 11b the molecule collides with another molecule, dismembering and changing direction. The magnitude of M2a + M2b is still equal to momentum M1 but the vectors direction has a tendency to randomize with every collision (Fig 13)

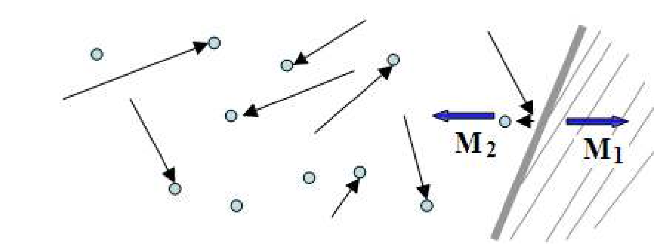


FIG 11a

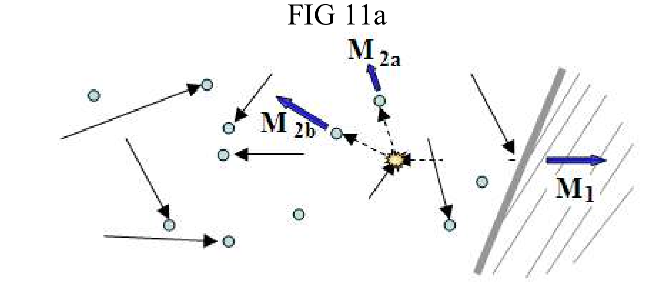


FIG 11b

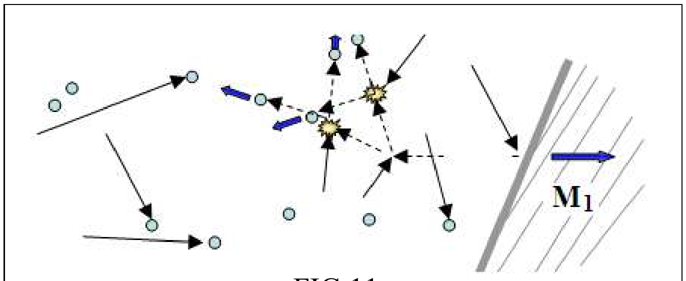
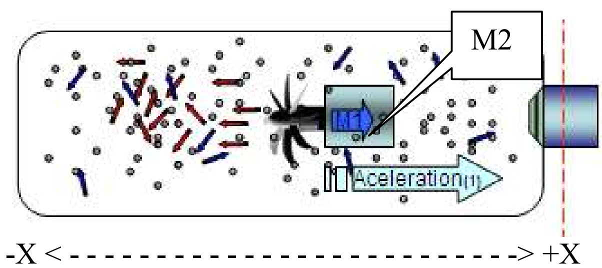


FIG 11c

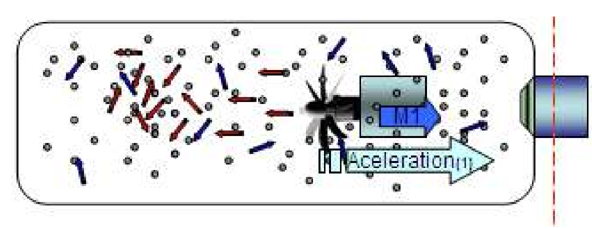
5. Cycle for generating trust

Having established that it is possible for the RMA (M2) to gain acceleration and momentum in the +X direction without greatly influencing the containing pressurized structure's velocity, I present a cycle for producing continues propulsion.



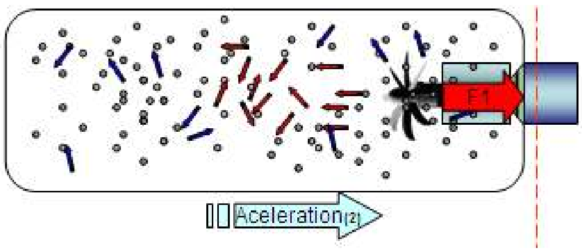
Cycle 0

In Cycle 0 we have the RMA (M2) activating it's propellers and accelerating (relative to M1) in the +X direction.



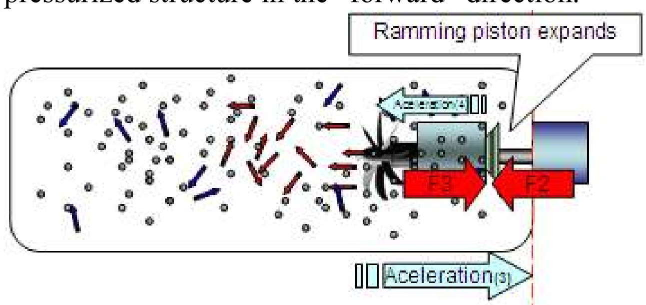
Cycle 1

As M2 advances, it increases its acceleration gaining momentum.



Cycle 2

The instant RMA (M2) collides with the pressured structure's "forward" hull, it transfers its momentum to the pressurized structure accelerating the pressurized structure in the "forward" direction.



Cycle 3

The instant of collision, a ramming piston expands excreting a strong (quick bump) force (F2) against the RMA (M2) accelerating the RMA (M2) in the "backwards" direction, moving it to the cycle 0 position where the cycle is repeated as long as electrical energy is available.
The opposite force (F3) further accelerates the pressurized structure in the "forward direction".

CONCLUSION

It is probably not possible to accelerate a closed system by any interaction of 2 or more **compact objects** inside the system, but If the interaction is between a **compact object** and **unbound particles**, such as a fluid (gas), the fluid's momentum is dismembered and redirected, reducing its final effect on the linear momentum, but the compact object (mass) retains its direction and momentum as described in classical mechanics.

Extensions to this article

A video describing this idea, including simple experimentations and future applications can be seen at: http://www.wjetech.cl/ (click on option 2)

Video of simple test model: http://www.wjetech.cl/ (click on option 6)

Description of the idea: http://www.wjetech.cl/ (click on option 3)

Description of simple desktop experiments that support the idea: http://www.wjetech.cl/ (click on option 4)

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