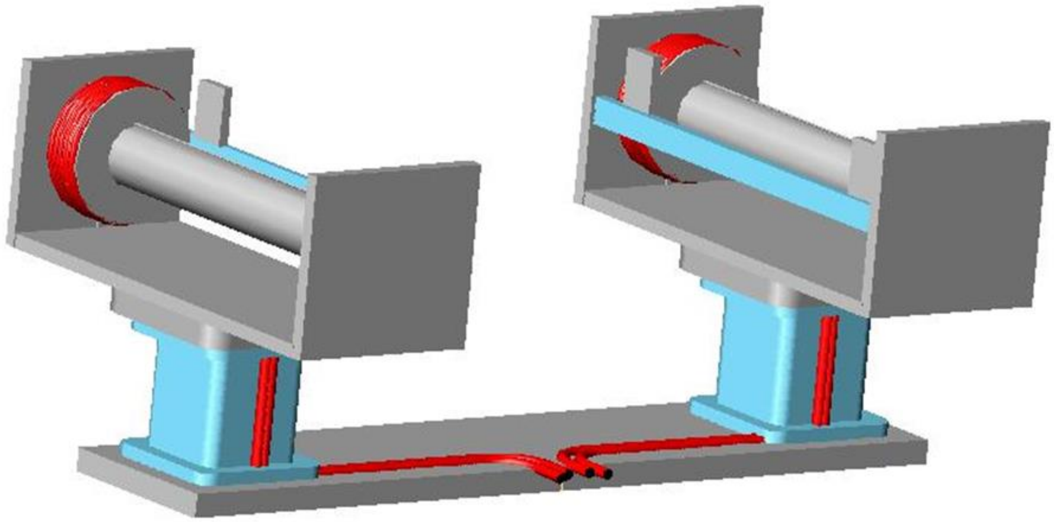
Electromagnetic thruster to drive vehicles



Introduction

This electromagnetic thruster generates force to propel a vehicle carrying cargo and passengers on roads, rails, in the sky, on water, underwater, and in outer space.

The ideal requirement of a vehicle should be, the ability to move about anywhere without the support of the medium through which it travels. Rocket propulsion is such a solution, but it ejects a massive quantity of propellants it carries with it. Probably, this exhaust can be hazardous to the environment.

The majority of propulsion systems in use today rely either on exerting forces against the surface over which they travel; otherwise ejecting propellant in opposite to the direction it travels in the form of exhaust of fuel carried by the vehicle.

The most common energy source on the ground is to carry chemical fuel aboard and make it react with the oxidizer in the environment. In automobiles, the wheels powered by the engines are pushing against the road or ground, while some other vehicles are on rails through friction. The internal combustion piston engines propel automobiles, ships, locomotives, and some aircraft.

The jet propulsion system employs nozzles to accelerate the fluid streams and push the vehicle in the opposite direction it has to propagate providing reactive force. The jet propulsion systems can be classified as air-breathing jet propulsion systems non-air-breathing jet propulsion systems or the rocket propulsion systems.

The energy needed for propulsion may come from an external source such as fossil fuel, from the environment like solar radiation, from an external link like powered rails or storage of onboard batteries.

Yet another propulsion system uses electromagnetic force to move vehicles on rails.

In summary, propulsion requires a force to cause motion with a second system being pushed backwards. Without a second system to be pushed backward, propulsion is not possible despite how much energy is available; and, without energy expenditure, propulsion is not possible either.

Propulsion is the generation of force by any combination of pushing or pulling to modify the translational motion of an object. The use of electrical power can improve the propulsive performance of the vehicle compared with conventional chemical thrusters. When compared with chemical propulsion, electric propulsion is not limited in energy, but limited by the available electrical power on-board.

Current applications of magnetic force in transport can be seen in maglev trains, elevators, and military railguns. For outer space navigation, there are methods still under research and experiments. It includes an Ion thruster for low-orbiting satellites and a magneto-hydrodynamic drive for ships and submarines.

The following statements disclose and show some examples of propulsion systems known so far:

The thought of using magnets for propulsion has continued for a long time. In 1889 Elihu Thomson discovered the concept of electromagnetic propulsion. In the 1960s Eric Roberts Laithwaite developed the linear induction motor, which built upon these principles and introduced the first practical application of electromagnetic propulsion.

In 1966 James R. Powell and Gordon Danby patented the superconducting maglev transportation system, leading to create high-speed rails.

Bearing Patent No.US5860317A Eric Laithwaite, Bognor Regis, William Dawson, patented Propulsion and positioning System for a vehicle comprises a gyroscope mounted for precession about an axis remote from the center.

In Patent EP90911733A Inventor Mortimer S. Delroy introduced another Gyrostat propulsion system. This gives the unidirectional controlled movement of the device based on a gyrostatic precession.

Electromagnetic propulsion system in US Patent US20100244590A1, states an electromechanical method that repels each other with strong and weak magnets to propulsion system uses magnetic propulsion and magnetic bearings to move a vehicle.

In patent JP2006046332A, United Technologies Corp, a propulsion system and propulsive force generating method introduced a propulsion system for creating a propulsive force, having a combustion chamber with a pair of electrodes.

The patent CN110406699A for propulsion and power generation integrated device used for space power system and operation method. In the year 2012 Inventors KEKE SUN patented Motor-driven cosmic space thruster bearing Pat Nos CN201210147436A·2012-05-07; CN102642626A·2012-08-22 describing a relay-style back-and-forth cycle to generate thrust to the space vehicle. It includes alternatively driven two electric motors to produce thrust on the vehicle alternatively using radial thrust of rotating masses.

Problems associated with current systems:

The Problem propulsion systems introduced so far are associated with some issues shown below:

- Volatile fuel is required to be carried by the vehicle that is dangerous to passengers and its contents.
- The systems known so far suffer the high cost of production of the machine parts and propellants.

- The range and maneuverability of vehicles using thrusters is limited by the amount of fuel carried. For generating propulsion most methods require the expenditure of masses as exhaust.
- Propellers are directly exposed to the medium the vehicle passes through. So propulsion pieces of machinery are liable to damage by the medium.
- Thrusters like Ion thrust engines are generally practical in vacuum space and they cannot overcome air resistance as well as they cannot generate sufficient thrust to liftoff from the ground. Therefore space exploration space crafts have to rely on other methods to move from the ground.
- Particularly, the known systems require a considerably large installation space.

For these reasons and others, a method capable of generating substantial thrust in an inexpensive way with a flexible layout is still prevailing.

Objectives of present invention:

The new system provides a better propulsion system that has hitherto not been possible. Introducing a method and device to generate thrust without spending propellant for propagation has particular utility in the propulsion of space vehicles.

Description:

The new device is an electromagnetic propulsion system capable of producing thrust to propagate and control a vehicle in the desired direction. The said propulsion system applies to all vehicles moving on the ground, on rails, in water, in the sky, and in outer space.

This Electromagnetic propulsion system constitutes at least an identical pair of reciprocating linear motors performing a back-and-forth cycle, each mounted on a rotary motor running on half-circle steps. Each linear motor with a rotary motor is termed as a module in the proceeding description. The linear motors of said two modules are mounted and secured at mid portions of their stator arms on said rotary motor armatures, lateral to axes of rotation of the associated rotary motor armature.

The two modules are placed apart and secured to the vehicle in a mirror position to each other. When power is supplied, two linear motor armatures move in a cycle along associated stator arms and rotate with accompanied rotary motor armatures in opposite directions to each other in unison during each rotation of rotary motors, performing a cycle of back-and-forth action. Thus the said two modules with the reciprocating linear motor pairs carrying rotary motors driven in opposed directions operate in identical specifications.

The electricity power supply and connections to controls of linear motors are carried over the housing of the rotary motor and connected to the terminals of the supply source.

The process of operation consists of four steps as follows, which can commence before the next step which includes:

- Setting the two linear motor arms in parallel along the intended propagation direction for the vehicle, and supplying programmed electrical power to draw the pair of LM armatures from the initial position to the opposite end along their stator arms;
- The associated rotary motors turn by 180 degrees to bring each linear motor armature to its previous location;
- Altering the direction of power supply to linear motors, the two linear motor armatures drive again along two LM stators from the present location to the opposite end;
- The rotary motors turn again by another 180 degrees to complete the cycle of rotation; and continue the sequence, thereafter.

However, each step can start before completing the previous step if desired.

Therefore, during each movement of two linear motor armatures, thrust is produced on accompanied LM stators, driving twice in the opposite direction during the cycle of rotation of the rotary motor armatures, thereby causing thrust along the desired direction on the body of the vehicle.

During the rotation of linear motor armatures, the radial thrust at instantaneous centers of rotation will be neutralized by having the two identical motors rotating in a mirror image configuration to each other.

Electrical power is supplied to energize the system from an electricity generator, batteries, fuel cells, solar power, or any other source capable of producing electricity.

When the vehicle has to change the direction of propagation, means are provided to tilt or turn said two modules individually or together along the intended direction.

Advantageously, to increase thrust, the power supply may increase, a plurality of thrusters may be added, as well as other types of thrusters and navigation systems may accompany the vehicle depending on the conditions and requirements.

Encoders and other sensing devices may be employed to provide feedback signals that can be used to determine position, count, speed, or direction.

The rotary motors may be servo motors or stepper motors as well.

The manner in which the above recited features of the present invention can be understood in details, a more particular description of the invention, briefly summarized above, may be had by reference to embodiments, some of which are illustrated in the appendant drawings.

Henceforth preferred embodiments of present invention taken in conjunction with the accompanying drawings, in which:

- Figure 01 is a perspective view of the typical electromagnetic thruster.
- Figure 02 shows views of Figure 01, from direction X in Figure 2A, from direction Y in Figure 2B, and direction Z in Figure 1C.
- Figure 03 shows another embodiment of the instant invention in combination with navigation controls attached to the primary design shown in 1st embodiment.
- Figure 04 shows details of the perspective view of Figure 03.

- Figure 05 depicts another example with rotary motors placed in line with controls mounted differently.
- Figure 06 shows a perspective view of Figure 05.
- Figure 07 shows yet another example of having a magnetic rod as an armature, inside the core of an electromagnetic coil set fitted on the rotary motor armature, letting the magnetic rod oscillate forward and backward inside the electromagnetic core.

<u>The index of identification numbers for the parts in figures and descriptions are as follows:</u>

20- LHS Rotary motor; 21- RHS Rotary motor; 22-LHS Linear motor; 23-RHS Linear motor; 24- vehicle body; 25- LHS LM armatures; 26- RHS LM armatures; 27-LHS LM stators; 28 -RHS LM stators; 29- RM armature; 30- RM armature; 31-LHS module mounting bracket; 32- RHS module mounting bracket; 33-LHS sensor; 34- RHS sensors; 35-LHS horizontal stepper motors; 36- RHS horizontal stepper motor; 37-LHS vertical stepper motor; 38 -RHS vertical stepper motors; 39-LHS device holder; 40 –RHS device holder; 41-LHS Rotary stage of stepper motor; 42-RHS Rotary stage of stepper motor; 50-LHS magnetic rod; 51-RHS magnetic rod; 52-LHS coil fitted on rotary armature; 53-RHS induction coil fitted on rotary armature; 54-central vertical stepper motor; 55- Horizontal stepper motor; 56-main armature shaft; 57-bearing for central frame; 58- Bracket to hold two module; 59- Primary mount for assembly; 60- Base frame; 61- Electromagnetic slots; 62- Magnetic slots; 70,71- Oscillating magnetic core; 72,73- Guide rails; 74,75- Electro- magnetic coil.

Method of operation –1

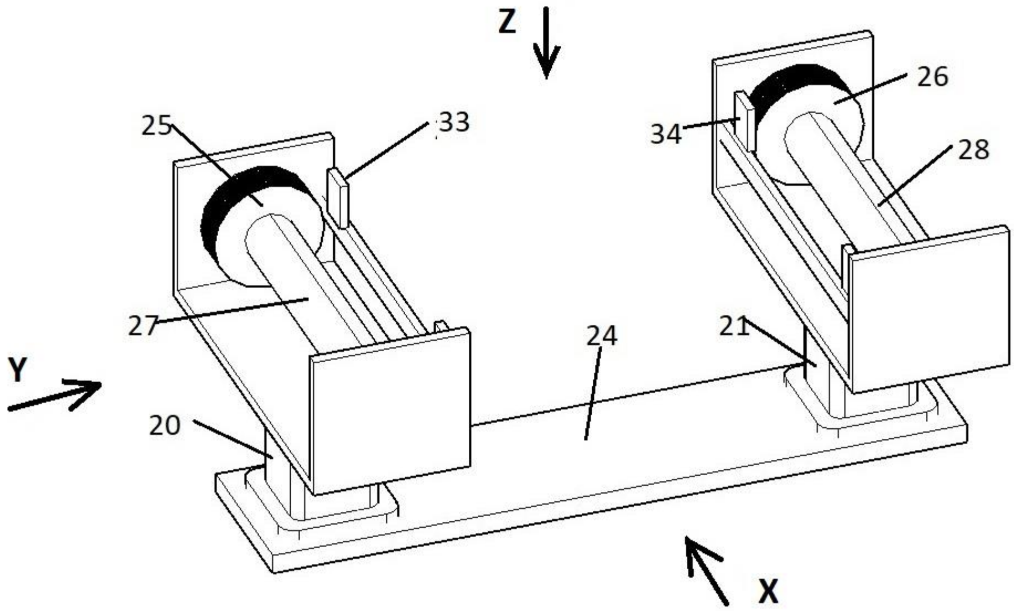


Figure .01

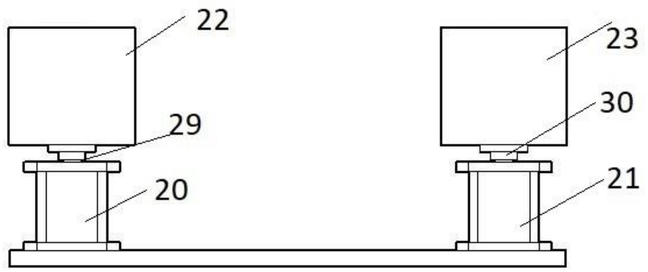


Figure 2A

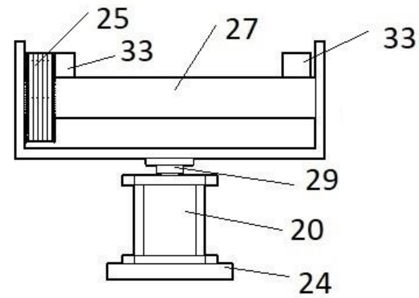


Figure 2B

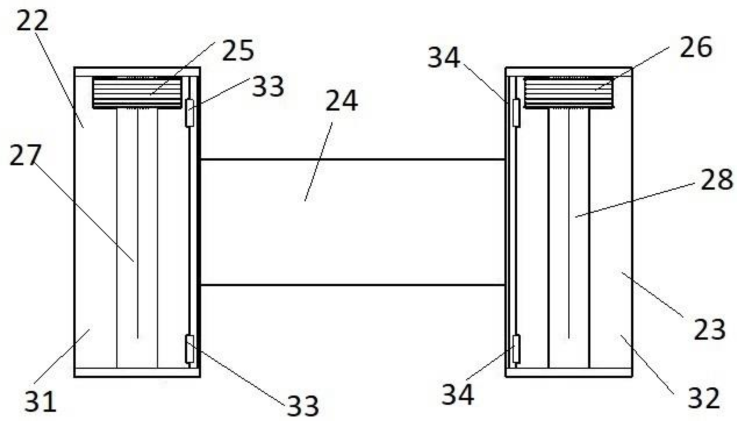


Figure 2C

Figure.02

The assembly of major components of the electromagnetic thruster is shown in Figure 1 with the power source and the controls removed. The device is in combination with rotary motors 20, and 21 over which two linear motors 22, and 23 are mounted on the armature shafts of said rotary motors.

The said two linear motor stators are mounted at their mid portions on rotary motor armatures 29, and 30, as seen in Figure 2, lateral to axes of rotation. Both rotary motor shafts are positioned on parallel axes placed adequately apart. The two modules operate with identical specifications, structures, performances, qualities, and powers.

The system is attached with sensors 33, and 34 to send signals to the operating system at every 180-degree rotation of the rotary motors as well as beginning and end of LM armature strokes.

During the rotation of linear motor armatures, the radial thrust at instant centers of rotation will be neutralized by having two identical armatures rotating in a mirror image of each other.
The process of operation consists of four steps: viz. Drawing LM armatures from the initial position to the other end position on the stator arm; Turning the LMs by 180 degrees by rotary motors; Altering the direction of electricity flow and thereby driving the LM armatures back to their initial locations; finally, Turning the LM armatures again by 180 degrees to complete the cycle of rotation. However, each step can start before completing the previous step if desired.

The motion is further accomplished without requiring additional control strategies to navigate the vehicle by providing the above-shown combination of tilting and turning at connecting points to the vehicles.
Electrical power is supplied to energize the system from an electricity generator, rechargeable batteries, fuel cells, solar power, or any other electricity-supplying source as appropriate.

Out look of Thruster without direction controllers

However, when the vehicle has to change the direction of propagation the said motor pairs may tilt or turn individually or together along the intended direction. Also, arrangements may made to tilt each module in the directions of forward, backward, left, or right from the fixation point of each module to the vehicle body.

Each module may be kept inside enclosures to protect from the environment. Advantageously, to expedite the thrust plurality of pairs of thrusters may be added, as well as other thrusters and navigate systems may accompany the vehicle depending on the requirement.

If smoother operation is required additional devices with strokes at different times may be added to the system in between power strokes.

However, for certain vehicles such as space-crafts those are not propagate through a medium, additional components are required to the propulsion system, as shown in proceeding embodiments to provide direction control of the vehicle. Particularly, by attaching the accessories described in the proceeding embodiments, the direction of thrust on the vehicle can control the direction of the vehicle in the required directions.

Method of operation –Example 2

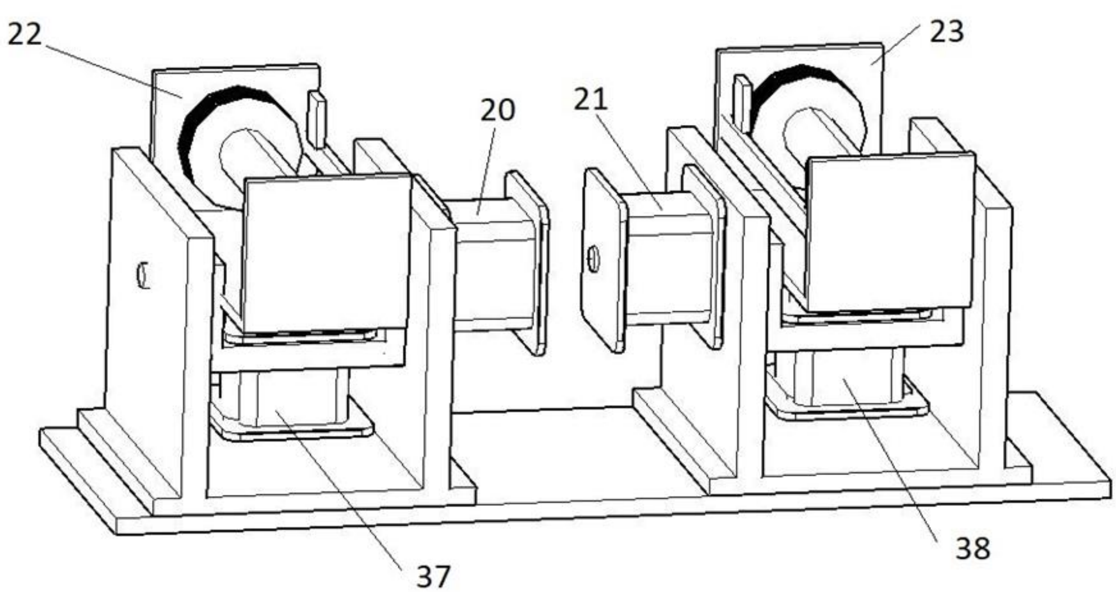


Figure. 03

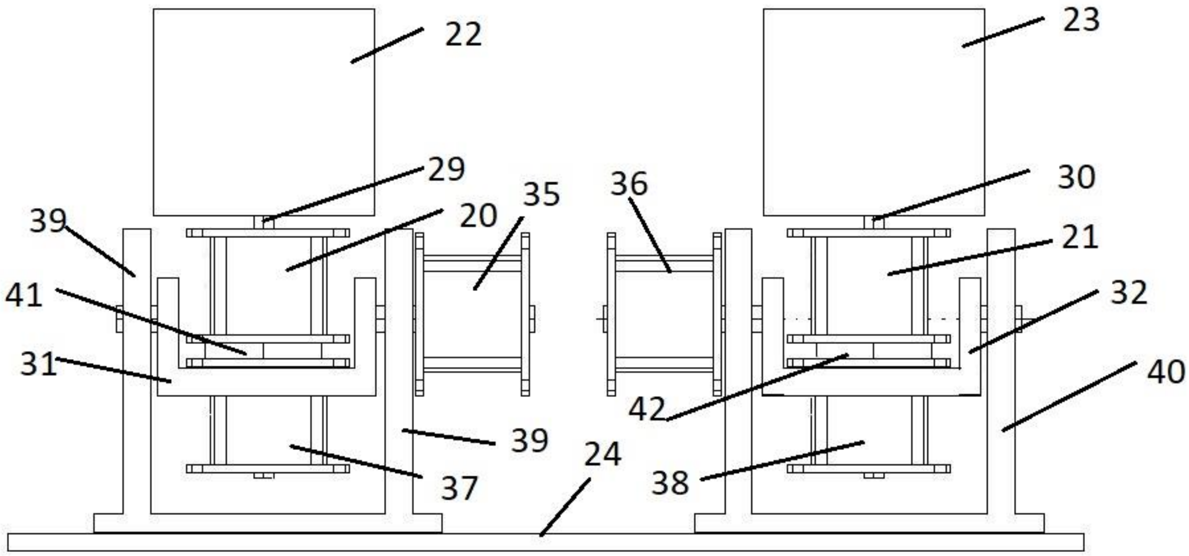


Figure. 04

Figure 03 and Figure 04 show an embodiment of the device in combination with navigation controls attached to the primary design shown in 1st embodiment. This Electromagnetic propulsion system has built-in direction controls, capable of producing thrust to propagate and control the vehicle in a desired direction.

Each module comprising a linear motor reciprocating forward and backward along the stator pathway are mounted on rotary motors 20, and 21 running in half circle steps and placed on turn tables 41,42 of stepper motors secured on mounts 31,32. The mounts 31, and 32 are provided with shafts and couple to stepper motors 35, 36 to turn about horizontal axes. Each module is rested on stepper motors 37, and 38 fitted with rotary tables 41, 42. Therefore the horizontal angle as well as vertical angle of modules is able to adjust to navigate the vehicle's desired direction.

Method of operation – Example 3

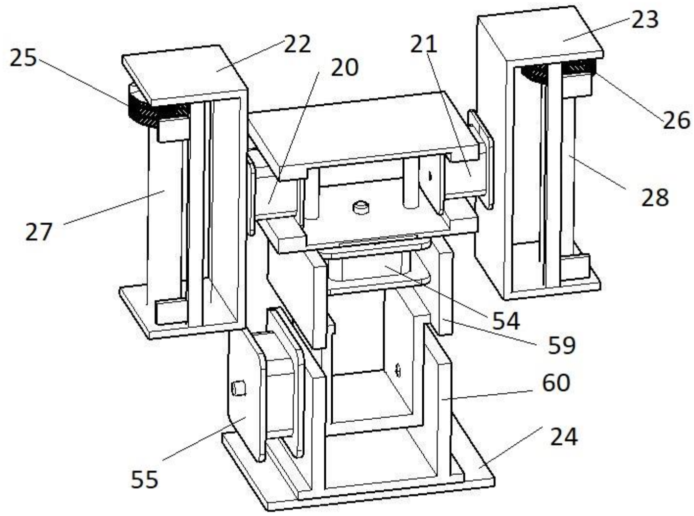
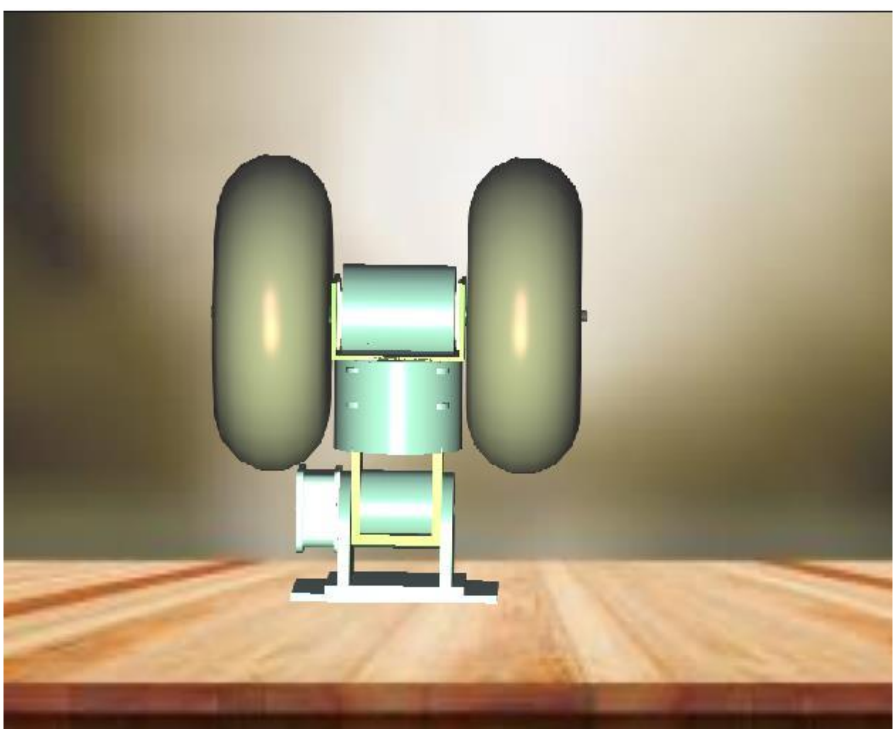


Figure 5



Outlook of Thruster with direction controls

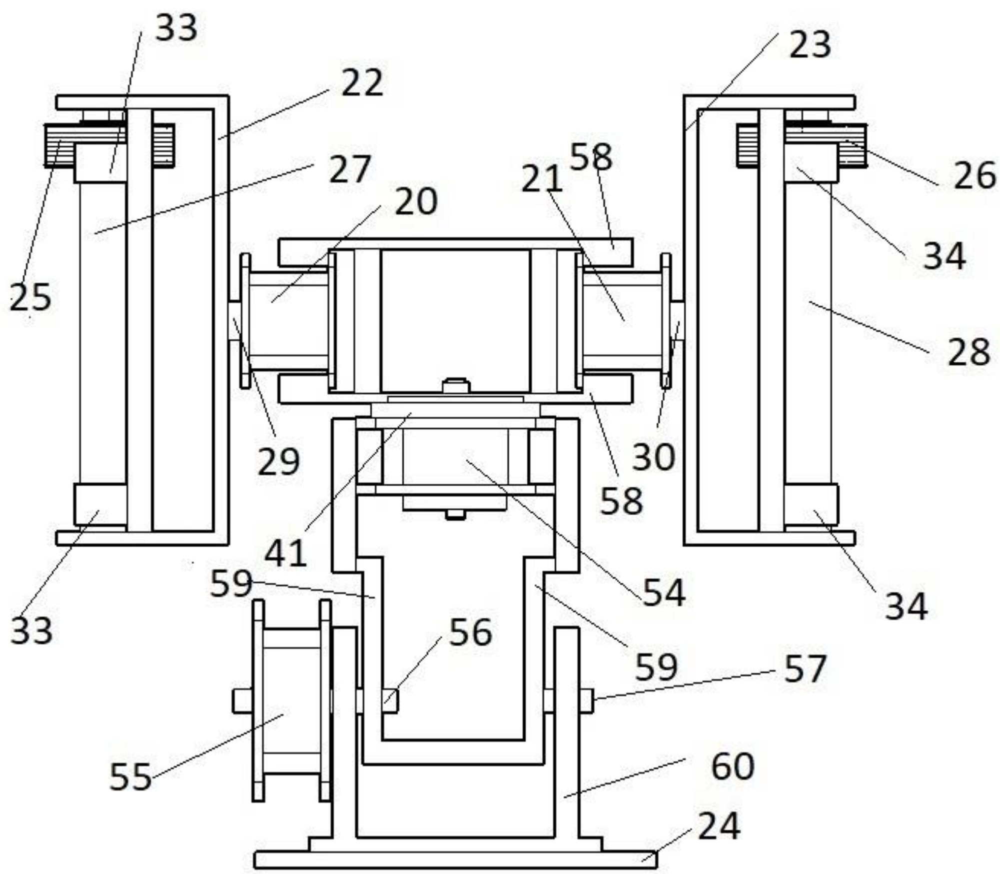


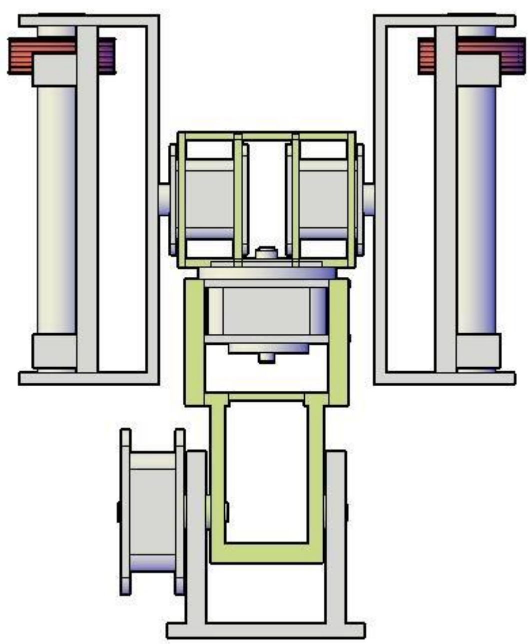
Figure 6

Another embodiment of the device is depicted in Figure 5 and Figure 6 to show another method of operation. In this arrangement, the two modules placed in mirror image position, having the linear stators 27, and 28 in the same directions, enable to running rotary motors 20, and 21 in opposite directions during operation. The rotary motors 20 and 21 are secured between clamps 58 holding the two linear motors 22, and 23 in parallel, facing armatures 25, and 26 in the same direction at the beginning of the cycle. The method of operation of two modules is the same as described in previous examples.

So, one rotary motor is set to turn clockwise and the other in counterclockwise to neutralize the radial thrust acting upon the system during rotary motion of linear motor armatures 25, 26 along with RM armatures.

The rotary motors 20, 21 are braced between clamps 58 and secured on the rotary table 41 fitted onto top of stepper motor 54 carried on mount 59, between bearing points 56 and 57.

The stepper motor 55 connected to mount 59 is thereby able to tilt the complete assembly along the vertical direction. Accordingly, the pair of modules is able to change its direction anywhere, by operating stepper motors 54 and 55. The said two motors 54 and 55 can be replaced with servo motors as well. The complete device is held on base frame 60 fitted to vehicle body 24 and control electrical power is fed from the power source placed in the vehicle. The operation of the system is similar to previously mentioned methods, except the linear motors are driven in parallel axes to the central axis of the system.



THRUSTER WITH DIRECTION CONTROLS

Method of operation –Example 4

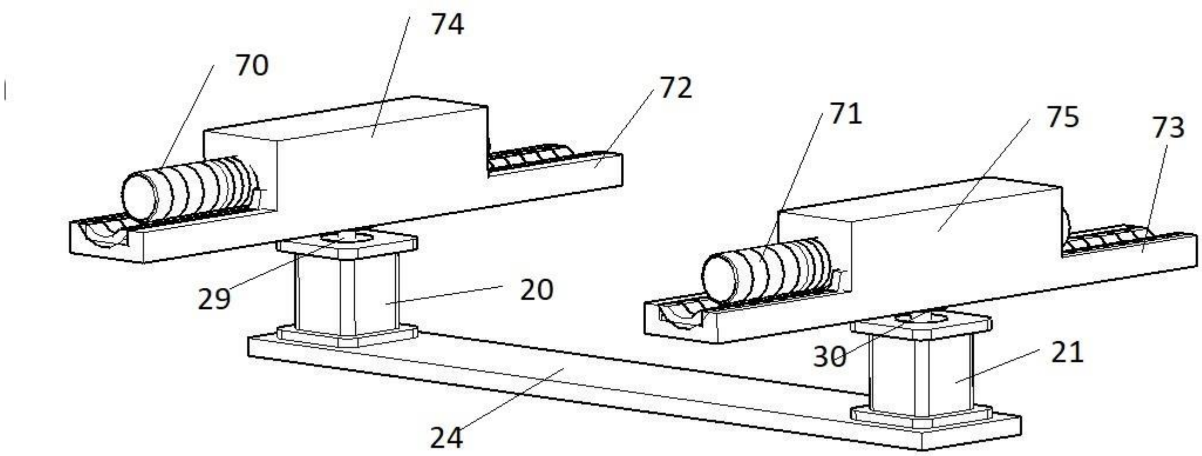


Figure 7

Figure 07 shows yet another example of having a linear synchronous motor pair. It comprises stators 74, and 75, which house an array of electromagnets, formed as armature rods 70 and 71 made of a ferromagnetic material or containing permanent magnets. The stators 74 and 75 generate traveling magnetic fields when they receive a three-phase alternating current, and the armatures 70, and 71 follow this field, creating a linear movement. By controlling the current's frequency and phase, the linear synchronous motor pair generates controlled linear motion to oscillate forward and backward while turning rotary motors 20, 21 in opposed directions to each other such that the rotary motors 20, 21 perform cyclic rotation as explained in previous examples at the same frequency, magnetic rod oscillates. The two modules may secured on a platform and use controls to change the vertical and horizontal angles of the device to control direction.

In general the attractive and repelling forces between the coils in the primary part and the magnets in the secondary part or vice versa cause the armature to move and generate a linear force. The rate of change of the current controls the velocity of the movement, and the amperage of the current determines the force generated.

Components of the motor drive may accompanied by controllers such as microcontrollers and microprocessors, to be operated directly or remotely.

Each linear motor module may include a housing to protect against the hazard of the medium through which the vehicle has to pass.

It is also possible to fix multiple linear motors to a single panel of a linear motor mounted on a rotary motor.

However the vehicle may comprise other conventional vehicle features, such as brakes, speed control, and direction controls that operate in response to the surrounding medium, the vehicle has to pass through.

Such instances are for road vehicles with steerable tires; for airplanes flight controls consisting of ailerons, elevators, stabilators, rudders, slats, and flaps as well as flight spoilers and trim systems; for ships boats and other vessels moving in waters such direction controls are rudders fitted within the hull.

The new thrusters may be fitted at any suitable location of the vehicle and may be on top, front, rearward, or sides’ as well, while the present vehicle's appearance is not required to change.

Accordingly, the following areas are those in which the invention is possible in application:

- Elevators for passengers, goods, and car lifts;
- Vehicles traveling on rails as well as on inclined conveyors;
- Automobiles traveling on roads and off roads including cars, motorcycles, and vehicles for public transport and vehicles transporting goods;
- Vehicles moving in waters including boats, ships, and submarines;
- Air vehicles including helicopters and airplanes;
- Vehicles used to explore and travel in outer space including launch vehicles, satellites, and rovers.

- It can use as a wearable device for pleasure walking, riding and gliding.

In particular, some advantages of the present invention are as follows:

1. Propellers can arrange not to be exposed to the environment or medium the vehicle has to pass through, so that propellers or other machine parts may don't get damaged by the contents and conditions of the medium.
2. Using the new thruster, the vehicle is operated by electrical power, generated by any power generating source, chosen from a wide range and also could be altered.
3. Strokes are generated by the linear armatures and they can produce high power.
4. The technology uses common materials that are commercially available, reducing cost, risk, and lead time.
5. The new thruster is applicable without the expenditure of propellants.
6. The present device is applicable in spacecraft propulsion and is capable of generating thrust without propellant. Also, it needs a very small space to accommodate and it can propel using solar power and stored power sources.
7. Since this thruster can impose pressure without aid of an interacting surface the new invention can use in civil engineering activities such as digging tunnels, excavating trenches, drilling holes, excavating and moving earth on ground.
8. This thruster is capable of using as wearable device for leisure walking and riding as well, depending on the scale of the device.

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