Feb. 3, 1970 A. J. VANDEN AUWEELE 3,492,881

PRIME MOVER

Filed April 12, 1967

FIG. 1.

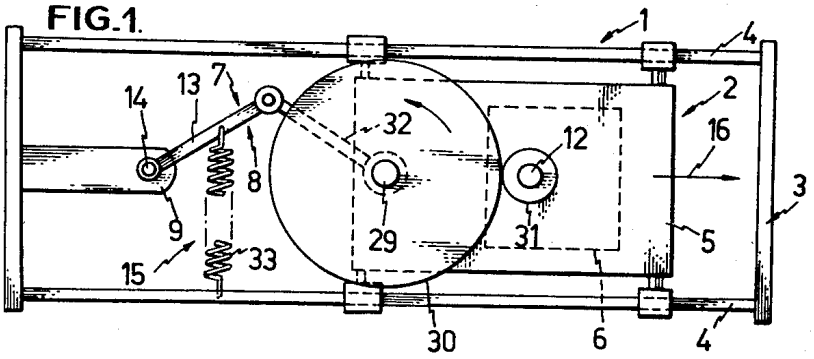



FIG. 2.

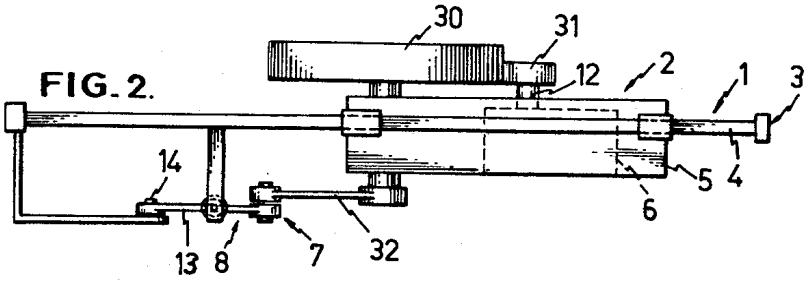



FIG. 3.

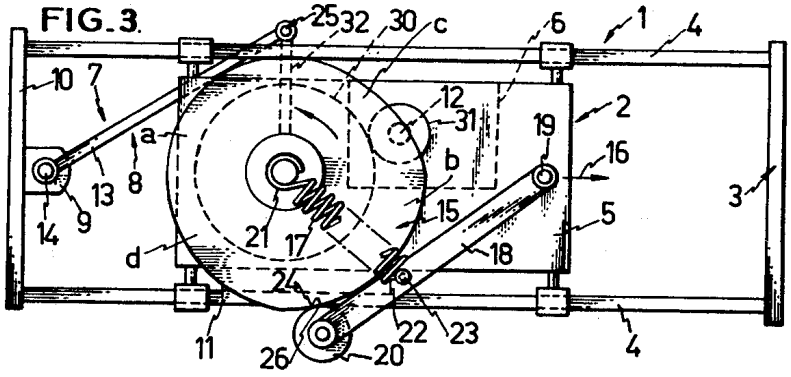
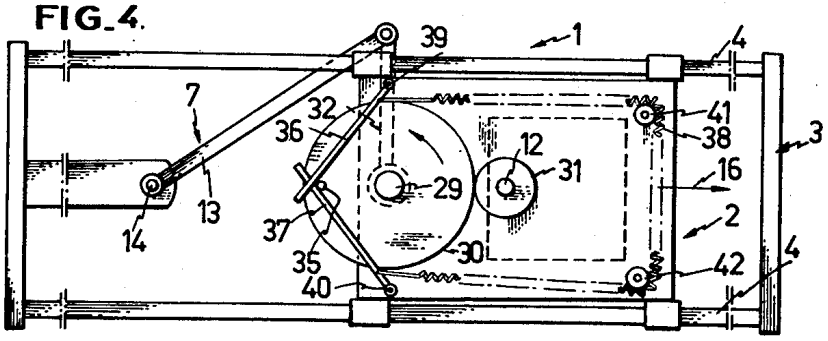



FIG. 4.



United States Patent Office 3,492,881
Patented Feb. 3, 1970



3,492,881

# PRIME MOVER

Albert Jozef Vanden Auweele, 18 Duizend Meterlaan, Brussels, Belgium

Filed Apr. 12, 1967, Ser. No. 630,324
Int. Cl. F16h 27/04
U.S. Cl. 74—84 18 Claims

## ABSTRACT OF THE DISCLOSURE

A first displaceable mass supports a second mass which is driven in reciprocation thereon through a flywheel and crank and rod system, there being a spring means subjected to deformation during one direction of travel of the reciprocating mass thereby to store energy, the spring means releasing the energy during the other direction of travel thereof to impart a net thrust on the first mass to displace the same.

This invention has for its object a prime mover.

The invention has for purpose to provide a prime mover which may be used to propel a vehicle in space, on earth, in the water or in the air. This prime mover may also be used to drive a dynamo or any other machine.

For this purpose, according to the invention, the prime mover comprises two associated masses which are movable with respect to one another, one of these masses being reciprocably driven by a motor in forward and rearward strokes along a straight line parallel or inclined relationship with the propulsion direction.

According to an embodiment of the invention, means are provided for the motor-driven mass to cause, as it reaches the ends of its strokes, an impulse on the other mass, the means being so arranged that the impulse force in one of said points is stronger than the impulse force in the other point, so as to obtain a net thrust producing movement along the propulsion direction, such direction being determined by said point where the impulse force is stronger.

According to an advantageous embodiment of the invention, said means is so arranged that the kinetic energy of the mass, when it moves along a vector with a component opposite to the propulsion direction, is smaller than the kinetic energy of the mass that moves along the direction opposite to the direction of said vector.

According to a particularly advantageous embodiment of the invention, said means comprises at least one element that converts, partly at least, the kinetic energy of the motor-driven mass into potential energy during part of the movement of this mass and which converts this potential energy into kinetic energy during another part of the movement of said mass.

Other details and features of the invention will become apparent from the description given below, by way of nonlimitative example and with reference to the accompanying drawings, in which:

FIGURE 1 is a diagrammatic elevation view of a prime mover according to the invention.

FIGURE 2 is a plan view corresponding to FIGURE 1.

FIGURE 3 is a diagrammatic plan view of a modification of embodiment of the prime mover shown in FIGURES 1 and 2.

FIGURE 4 is a diagrammatic plan view of a modification of embodiment of the prime mover shown in FIGURES 1, 2, and 3.

In the various figures, the same reference numerals pertain to similar elements.

The prime mover according to the invention and shown in the drawings comprises two masses **1** and **2**, the mass



**1** being comprised of a framework **3** with two parallel rails **4**, over which moves a carriage **5** that comprises the mass **2**. The carriage **5** is driven by a motor **6**, integral with the carriage, and connecting means **7** are provided to insure an alternating motion of said carriage relative to the framework **3**. The connecting means are comprised of a rod and crank system **8**, the rod **13** of which is hinged to a part **9** integral with the cross-bar **10** of the framework and the crank **32** of which is attached by the foot thereof to the shaft **29** of a fly-wheel **30**. The shaft **12** of the motor **6** and the shaft **29** of the fly-wheel are in parallel relationship, the fly-wheel **30** being driven at the periphery thereof by a wheel **31** fixed to the shaft of said motor **6**. The rod **13** and the crank **32** have substantially equal lengths and the shaft **14** about which the rod **13** swings, the shaft **29** and the shaft **12** of the motor are in parallel relationship. The prime mover has means **15** comprised of a spring **33** which is attached on the one side to the framework and on the other side to the rod **13**. This spring **33** is to be tensioned to convert into potential energy part of the kinetic energy of the carriage **5** during the first half of the travel thereof along the propulsion direction as shown by the arrow **16** and to give back this potential energy as kinetic energy to the carriage **5** during the second half of the travel thereof along said propulsion direction and during the first half of the travel thereof in the direction opposite to the propulsion direction, the spring **33** being tensioned to convert into potential energy the kinetic energy of the carriage **5** during the second half of the travel thereof along the direction opposite to the propulsion direction. By means of the spring **33**, different resistance is applied to the carriage during its forward and reverse strokes, and consequently the impulsion is larger, by the end of the travel thereof along the propulsion direction **16** than by the end of the travel thereof when it moves along the direction opposite to the arrow **16** whereby a net thrust is produced on the mass. There is thus obtained a prime mover which always moves in the same direction, that is along the direction of arrow **16**.

According to the invention and as shown in FIGURE 3, the prime mover comprises means **15** comprised of a spring **17**, a cam **11** and a lever **18** that swings about an axis **19** in parallel relationship to the shaft of the motor **6**, on the carriage **5**.

The cam **11** is fixed to the shaft **29** of the fly-wheel **30** and acts on a roller **20** mounted on the lever **18**. The end **21** of the spring **17** is integral with the shaft **29** of the fly-wheel while the end **22** of said spring is attached in **23** to the lever **18**. The engagement point **24** between the cam and the roller is located on a circle having as its center the trace of the swivelling axis **19** of the lever **18** and for its radius the distance between the axis **19** and the axis of the fly-wheel shaft **29**. The cam **11** is comprised on the one hand, of two circle sectors *a* and *b* with different radii, the apex of which lies on the axis of the shaft **29** of the fly-wheel **30** and the angles of which are right angles opposed by the apex and, on the other hand, of two sections *c* and *d* located between both said sectors and the curved edges of which extend in prolongation of the arcs of the sector edges. During the rotating of the cam **11**, in the direction shown in the drawing, the spring **17** is tensioned when the roller **20** moves on the periphery of section *d* and released when said roller **20** moves on the section *c*. The rod **13** is hinged in **25** and the length of this rod is such that a plane at right angle to the rails and passing through the motor shaft comprises the swivelling axis of the rod when the engagement point between the roller **20** and the cam coincides with the point **26** of the cam **11**.

FIGURE 4 shows a prime mover which comprises, as does the prime mover shown in FIGURES 1 and 2, a carriage **5** moving on rails **4** of a framework **1**, a fly-wheel **30** driven by a wheel **31** fixed to the shaft **12** of a motor, and a rod and crank system **8**.

The fly-wheel **30** is provided on the upper side thereof adjacent the periphery, with a lug **35** against which two levers **36** and **37** are applied freely under the action of a spring **38**. The levers **36** and **37** are hinged respectively in **39** and **40**, at one end thereof to the carriage **5**, on either side of the fly-wheel **30**, so as to swing about axes in parallel relationship with the shaft **29** of the fly-wheel **30**.

The one end of the spring **38** is attached to the lever **36**, the other end of said spring **38** being attached to the lever **37**. Said spring **38** is bent into a U-shape about rollers **41** and **42** mounted on the carriage **5** and swivelling about axes in parallel relationship with the shaft **29** of the fly-wheel **30**.

The position of the lug **35** with respect to the crank **33** is such that at both ends of the travel of the carriage **5**, the lengthwise axes of the levers **36** and **37** are located in the plane comprising the axes **39** and **40** about which the levers **36** and **37** swing. Moreover, the spring **38** must be so arranged that, at said travel ends, the force component in the radial direction of the fly-wheel **30** exerted by the spring **38** on the lug **35**, through the levers **36** and **37** is zero and that, consequently, the potential energy stored in the spring **38** may be entirely used for accelerating the fly-wheel **30** and consequently the carriage **5** relative to the framework, as the spring **38** releases, that is when the carriage **5** moves along the propulsion direction **16**. When the spring is tensioned, during the displacement thereof along a direction opposite to the propulsion direction, the converting of the kinetic energy of the carriage **5** has a high efficiency when said carriage reaches the travel end, in the direction opposite the propulsion direction **16**.

To obtain said results, as the hinging axes **39** and **40** of the levers **36** and **37** are located on either side of the fly-wheel **30**, in a plane that comprises the axis of the shaft **29** of the fly-wheel **30** at right angles to the propulsion direction **16**, the lug **35** in this particular case, is displaced by an angle of 90° with respect to the crank **32**, this angle being considered in the direction the crank **32** rotates.

The position of the hinging axes **39** and **40** of the levers **36** and **37** may be changed, but the position of the lug **35** is dependent on the position of the crank **32**.

Thus, for example, when the hinging axes **39** and **40** are located in a plane in parallel relationship with the propulsion direction **16**, the angle enclosed by the crank **32** and that radium of the fly-wheel **30** which passes through the axis of the lug **35** must perferably be zero. In such a case, according to the invention, the lug may be located on the crank **32**.

Thus, the impulse of the carriage **5** at this travel end is reduced to a minimum and a maximum of kinetic energy is converted into potential energy. This potential energy is suddenly released when the carriage **5** reaches the travel end thereof along the propulsion direction, so as to have a maximum impulse at this end of the travel.

The tension of the spring **38** may be adjusted by suitable means, which are not shown.

When the motor is started, for instance by means of a rheostat in the case of an electric motor, the carriage **5** slides over the rails **4**.

Immediately after starting the motor **6**, the power supply thereof is reduced by means of said rheostat, in such a way that the motor comes to a momentary stop when the engagement point between the roller **20** and the cam **11** coincides with the point **26**, located between the section *c* and the sector *b*, such position being reached when the carriage **5** moves in a direction opposite the arrow **16**. Thus, the motor energy is in balance with the maximum energy that may be stored by the spring **17**. From this moment on, the framework **3** undergoes a series of pushes in the direction of the arrow **16** and consequently the framework moves along this direction.



To increase the speed of the engine provided with the prime mover, one only has to adjust the tension of the spring to increase the pressure of the roller **20** on the cam and to adjust again the motor supply to reach said balance.

The operation of the prime movers shown in FIGURES 1, 2 and 4 is similar to the operation of the prime mover shown in FIGURE 3 and described above.

The framework **3** is to be mounted on an engine so as to be swingable thereon. The direction reversals of the engine are obtained by pointing the rails **4** of the framework along a direction in parallel relationship with the desired movement direction.

I claim:

**1.** A vehicle comprising a displaceable first mass, a second mass slidably supported on said first mass, drive means including a motor and connection means between said masses and coupled to said motor for reciprocating the second mass on said first mass in forward and reverse strokes, and interference generating means acting on said drive means during reciprocation of the second mass to apply different resistance to the displacement of the second mass during its forward and reverse strokes in each reciprocation to produce a net thrust on the first mass.

**2.** A vehicle as claimed in claim **1**, in which the second mass is larger than the first mass.

**3.** A vehicle as claimed in claim **1**, in which the motor is carried by one of the masses.

**4.** A vehicle as claimed in claim **3**, in which the first mass comprises a framework with at least one guide rail, said second mass including a carriage slidably mounted on said rail, the motor being integral with the carriage.

**5.** A vehicle as claimed in claim **4**, in which the connection means comprises a rod and crank system hingeably connected to the framework and to the carriage, said rod and crank system being driven by said motor.

**6.** A vehicle as claimed in claim **5**, wherein said connection means further comprises a fly-wheel having a shaft, said motor driving the rod and crank system through said fly-wheel, said system having a crank fixed to the fly-wheel shaft.

**7.** A vehicle as claimed in claim **6**, in which said motor includes an output shaft which is in parallel relationship with the fly-wheel shaft, and a wheel fixed to said output shaft and in driving relation with the fly-wheel at the periphery thereof.

**8.** A vehicle as claimed in claim **5**, in which said system includes a rod and crank of substantially equal length.

**9.** A vehicle as claimed in claim **1**, in which said interference generating means comprises a resilient member.

**10.** A vehicle as claimed in claim **9**, in which said resilient member is a spring.

**11.** A vehicle as claimed in claim **10**, in which said means for reciprocating the second mass comprises a drive motor, and a rod and crank system connected to said first and second masses and driven by said motor, said spring having one end attached to the rod and an opposite end attached to the first mass.

**12.** A vehicle as claimed in claim **10**, wherein said means for reciprocating the second mass comprises a drive motor, a fly-wheel driven in rotation by said motor, a rod and crank system connected to said fly-wheel and said first mass, said interference generating means further comprising a lug rotatable with said fly-wheel, a pair of levers hingeably connected to said second mass for pivotal movement about axes parallel to the axis of rotation of the fly-wheel, said spring having opposite ends connected to respective levers to apply the same against said lug.

13. A vehicle as claimed in claim 12, in which the axes of rotation of said levers extend at right angles to the direction of displacement of said first mass.

14. A vehicle as claimed in claim 12, in which the means for reciprocating the second mass further comprises a fly-wheel with a shaft coupled to said motor for being driven therewith, the axes about which the levers pivot being located on either side of the fly-wheel shaft, in a plane that comprises the axis of said shaft.

15. A vehicle as claimed in claim 14, in which said plane comprising the axes about which the levers pivot is substantially at right angles to the direction of travel of the second mass, said rod and crank system including a crank connected to the fly-wheel 90° behind the lug relative to the direction of rotation of the fly-wheel.

16. A vehicle as claimed in claim 10, wherein said intereference generating means further comprises a driven cam, a pivotal lever on the second mass and having a roller acting on the cam, one end of said spring being



fixed to the second mass while the other end of the spring engages the lever to apply the roller against the cam.

17. A vehicle as claimed in claim 16, in which the means for reciprocating the second mass comprises a driven shaft, said cam being provided with a circular shoulder in driving relation with said shaft, said cam constituting a fly-wheel.

18. A vehicle as claimed in claim 16, in which the cam has a profile to cause tensioning of said spring during part at least of the travel of the second mass.

**References Cited**

UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 3,215,209 | 11/1965 | Desvanx et al. | 74—61 X |
| 1,280,269 | 10/1918 | Miller. | |


MILTON KAUFMAN, Primary Examiner