DOCKETED	
Docket Number:	19-ERDD-01
Project Title:	Research Idea Exchange
TN #:	227588
Document Title:	Hong Yew Comments - Self-running Power Generator Using Flywheels and Levers
Description:	N/A
Filer:	System
Organization:	Hong Yew
Submitter Role:	Public
Submission Date:	4/9/2019 3:13:15 PM
Docketed Date:	4/9/2019

Comment Received From: Hong Yew
Submitted On: 4/9/2019
Docket Number: 19-ERDD-01

Self-running Power Generator Using Flywheels and Levers

Additional submitted attachment is included below.

1. **Abstract for US Patent 10167856**

This invention is based on rotating flywheels for main energy source and connecting levers which provide mechanical advantage.

Rotating flywheels are the energy source driven by mass, radius, and speed. Therefore, the last flywheel in series must be capable of handling a load it is designed for.

Flywheel's Moment of inertia seen at the center of mass and moment of inertia seen at the edge or rim is

$I_{COM} = 1/2\ MR^2$

$I_{RIM} = 3/2\ MR^2$

M is mass of the solid wheel, R is the length of the radius of solid wheel, and the moment of inertia at the rim or edge of the flywheel is based on the parallel axis theorem that equates to point mass analysis.

Using this parallel axis theorem and point mass analysis,

$I_{RIM} = I_{COM} + MR^2 = ½\ MR^2 + MR2 = 3/2\ MR^2$

Here we can see the moment of inertia at the rim is three times greater than the center of mass by looking at the difference between 1/2 MR^2 and 3/2 MR^2. This moment of inertia in a rotational motion becomes Rotational Kinetic energy at center of flywheel is $1/2\ I_{COM}\ w^2$, and Rotational Kinetic energy at edge of flywheel is $3/2\ I_{RIM}\ w^2$ where w is the angular velocity.

Here we can see three times of rotational energy at the edge of a flywheel compared to the center of mass, and utilizing this available energy is the core of this invention. Transferring this energy with maximum efficiency is another core of this invention by use of mechanical levers at 180 degrees apart. Each of the rotating flywheel is connected by two levers at 180 degrees apart on each side of flywheel providing mechanical advantage based on the ratio of length between one end-to-fulcrum and the other end-to-fulcrum.

This allows taking advantage of the mechanical lever known as the law of the lever.

As proven by Archimedes the law of lever mechanical advantage (MA) is expressed as

MA = Fo / Fi = a / b

Fi x a = Fo x b

where Fo = output force, Fi = input force, a = lever distance from input side to fulcrum, b = lever distance from output side to fulcrum.

Levers connected to both ends of flywheel on each side drives a unidirectional solid rod at the other end of the levers. Each lever is connected at 180 degrees apart at both sides. Since each end of the flywheel at the input side is connected to a lever at 180 degrees apart, two levers at the output side drive the unidirectional-solid-rod into a rotational motion as the levers move up and down.

Direction of the rotational motion of this unidirectional-solid-rod is set by the shape of the rod since the levers move only up and down.

This invention takes advantage of the moment of inertia provided by the flywheel in addition to taking advantage of the lever actions for maximum efficiency in energy transfer from one flywheel to next. By combining these two simple methodologies, greater energy savings and output improvements are achieved.

More than one set of this design can be installed for the required output level as shown in Figure 1.

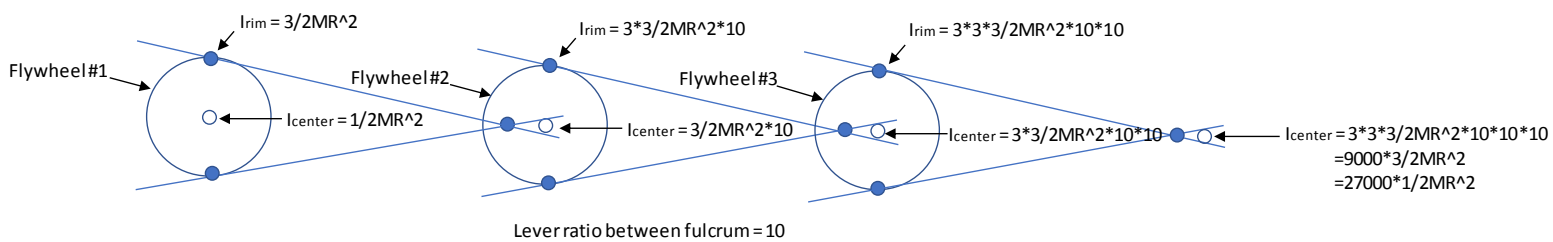
By coupling the rotating flywheels and moving levers, substantial gain at the output is achieved based on the moment of inertia provided by the rotating flywheels and the ratio of length of levers to and from fulcrum.

This is the basis for US Patent No. 10167856.

Based on the descriptions above, each flywheel generates 3 times the rotational force at each rim, and this is further multiplied by the levers. Using MA (mechanical advantage) of 10, we can achieve 3x10 = 30 efficiencies at each stage as shown in Figure 1. This means we can increase the mass of the successive

flywheel to 30 times to increase the energy source while maintaining the same input at the first flywheel. This is the beauty of this invention making it possible to be a self-running power generator. When we have 5 sets of flywheels in series with thirty times of efficiency increase at each flywheel, the total output efficiency is 30^5=24,300,000! Each flywheel in series must have its mass increased by 30 times of the previous flywheel so that the ***increased mass becomes increased energy source***. Each increased mass is rotated by the efficiency of levers without requiring any additional force other than the very first flywheel. A generator is connected to the last flywheel based on the load the last flywheel can drive. This design is scalable and can be modularized for easy transport. No fossil fuel needed, and it is self-running.

Figure 2 shows the top view of the first stage flywheels and levers.



Flywheel #1:
Moment of inertia at the center is 1/2MR^2 while moment of inertia at the rim is 3/2MR^2. Moment of inertia is increased 3 times more at the rim based on parallel axis theorem.

Flywheel #2:
Moment of inertia at the center is 3/2MR^2*10 while moment of inertia at the rim is 3*3/2MR^2*10. This provides 90 times more than I_{center} of Flywheel #1 based on parallel axis theorem and lever multiplying factor. Now, the **mass of flywheel #2** can be **increased by 90 times** for **increased rotational kinetic energy source** using the same input power at flywheel #1.

Flywheel #3:
Moment of inertia at the center is 3*3/2MR^2*10*10 while moment of inertia at the rim is 3*3*3/2MR^2*10*10. This provides 2700 times more than I_{center} of Flywhee #1 based on parallel axis theorem and lever multiplying factor. Now, the **mass of flywheel #3** can be **increased by 2700 times** for **increased rotational kinetic energy source** using the same input power at flywheel #1.

Output rotating shaft:
Moment of inertia at the center is 3*3*3/2MR^2*10*10*10. This provides 27000 times more than I_{center} of Flywhee #1 based on parallel axis theorem and lever multiplying factor. Now, the **increased mass of flywheel #3 provides rotational kinetic energy** via levers using the same input power at flywheel #1.

Figure 1. Simplified block diagram for flywheels and levers in series

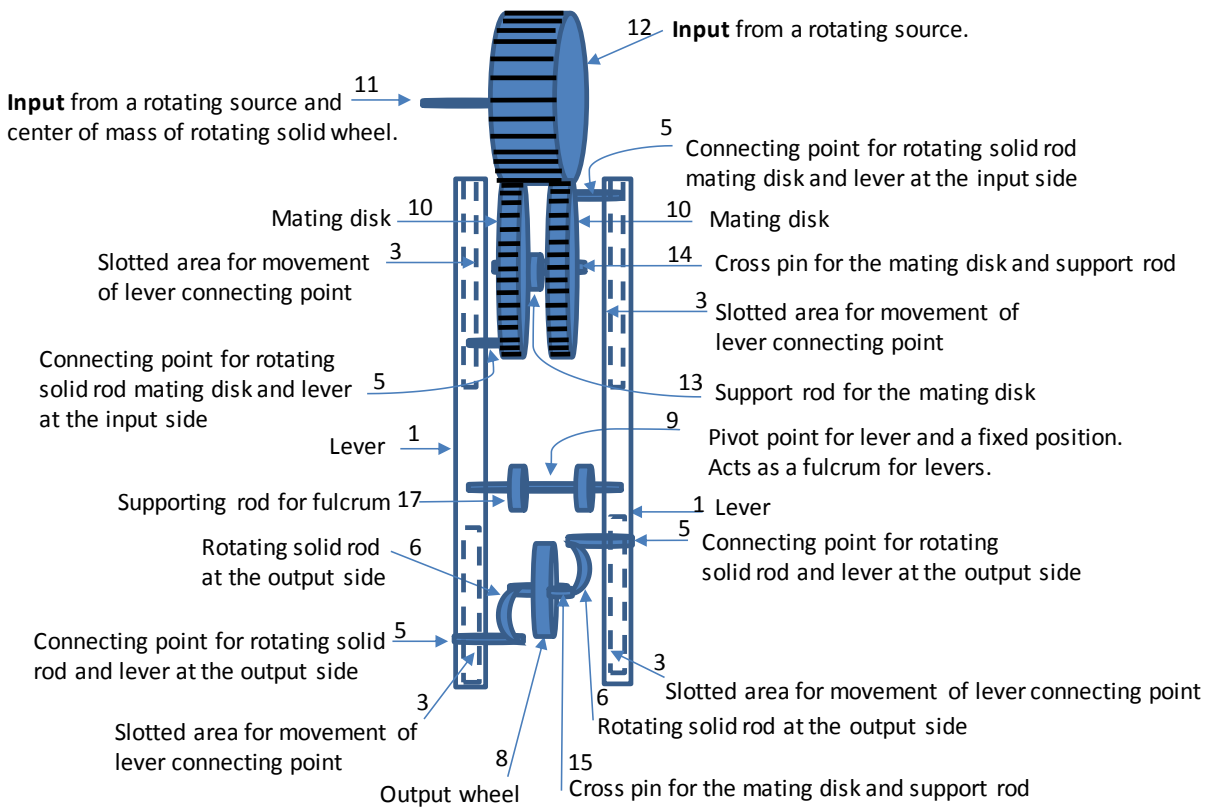


Figure 2. Top view of first stage flywheel and levers