A human powered land vehicle sufficiently rigid so as to transport a human rider constructed only from pulpably recyclable and shreddably recyclable materials.
RECYCLABLE CARDBOARD BICYCLE

FIELD AND BACKGROUND OF THE INVENTION

[0001] The present invention relates to a recyclable velo-pede and, more particularly, to a bicycle made from honeycomb cardboard or corrugated honeycomb cardboard, with various polyethylene terephthalate (PET) components.

[0002] Typically, bicycles and children's vehicles (tricycles, 'scooters', etc.) are constructed from durable, lightweight materials which are not easily recycled. Steel, plastic, rubber and numerous other materials are combined together to provide a comfortable, utilitarian vehicle for recreational use. The final products range from the moderately priced to the very expensive. Typically, such vehicles are purchased and kept until they become unusable, either due to damage or no longer being age appropriate. At this point the vehicle is usually discarded, destined to take its place in some unnamed landfill.

[0003] The current invention provides a lightweight, durable and fully recyclable bicycle. The embodiments depicted herein below have an approximate weight of seven Kilograms, can bear the weight of at least two hundred Kilograms and is made of components which are 100% recyclable using standard recycling methods.

DEFINITIONS

[0004] Recycling

[0005] Strictly speaking, almost any material can be recycled. Therefore, for the purposes of this application, the terms 'recycle', 'recyclable', 'recycling', 'pulvably recyclable' and the like are defined as referring to the process of reducing a material from a substantially solid form into a slurry, by adding water, and subsequently drying the slurry to produce a material substantially identical to the original material. In addition, the terms 'recycle', 'recyclable', 'recycling' and 'shredably recyclable' are understood to also relate to the recycling process of a material such as PET, wherein the material is ground into flake form and cleaned thereby rendering it reusable in a variety of useful products such as carpet fiber, striping, molding compounds, and non-food containers.

[0006] Honeycomb Cardboard

[0007] The current invention is constructed from honeycomb cardboard or corrugated honeycomb cardboard and includes PET and/or cardboard components. The terms 'corrugated honeycomb cardboard' and 'honeycomb cardboard' are defined herein as referring to material made up of at least two linerboards and honeycomb filling made from paperboard, fiberboard or cardboard. Honeycomb cardboard is well known in the art and its uses are well documented, for example in US Patent Application 2006/0207481 to McCarthy which is incorporated by reference for all purposes as if fully set forth herein.

[0008] The preferred honeycomb cardboard for the embodiments described here below is known as Fini 440 due to the weight per square meter being 440 g/sq. meter. Preferably the depth of the honeycomb cardboard filler is in a range between 15 mm and 70 mm. More preferably the range is between 20 mm and 50 mm. Most preferably the range is between 30 mm and 40 mm.

[0009] Cardboard

[0010] In addition to the materials specifically mentioned, the current invention may alternatively and/or additionally be comprised of cardboard and similar materials such as paperboard and fiberboard. The term 'cardboard' when not specifically designated as honeycomb cardboard, is a general reference to one or more of the cardboard-like materials namely, cardboard, paperboard, fiberboard, honeycomb cardboard, corrugated cardboard, corrugated fiberboard, corrugated paperboard and corrugated honeycomb cardboard, and/or a combination thereof.

[0011] Scooter

[0012] The term 'scooter' is defined for the purposes of this application as a pedal-less vehicle propelled by the user's legs pushing off against a surface, usually the ground, unless specifically denoted as being motorized.

SUMMARY OF THE INVENTION

[0013] According to the teachings of the present invention there is provided a human powered land vehicle wherein the vehicle includes (a) a frame and (b) at least one pulvably recyclable wheel and shredably recyclable hub arrangement coupled to the frame wherein the frame is propelled by a user of the vehicle by effecting the rotation of the at least one wheel and hub arrangement.

[0014] According to further features in preferred embodiments of the invention described below the pulvably recyclable wheel includes cardboard and/or paperboard and/or fiberboard and/or honeycomb cardboard and/or corrugated cardboard and/or corrugated paperboard and/or corrugated fiberboard and/or corrugated honeycomb cardboard and the shredably recyclable hub includes PET and/or one or more thermoplastic material and/or one or more recycled plastic material.

[0015] According to still further features in the described preferred embodiments the vehicle is a unicycle.

[0016] According to still further features in the described preferred embodiments the vehicle is a tricycle.

[0017] According to still further features in the described preferred embodiments the vehicle is a bicycle.

[0018] According to still further features in the described preferred embodiments the vehicle is a scooter.

[0019] According to another aspect of the present invention there is provided a vehicle including (a) a pulvably recyclable fork and (b) at least one pulvably recyclable wheel and shredably recyclable hub arrangement coupled to the pulvably recyclable fork.

[0020] According to further features in preferred embodiments of the invention described below the pulvably recyclable fork and wheel includes cardboard and/or paperboard and/or fiberboard and/or honeycomb cardboard and/or corrugated cardboard and/or corrugated paperboard and/or corrugated fiberboard and/or corrugated honeycomb cardboard.

[0021] According to still further features in preferred embodiments, the shredably recyclable hub includes PET and/or one more thermoplastic material and/or one or more recycled plastic material.

[0022] According to another aspect of the present invention there is provided a vehicle including a recyclable drivetrain wherein the recyclable drivetrain includes pulvably recyclable or shredably recyclable material. Preferably the pulvably recyclable material includes cardboard and/or paperboard and/or fiberboard and/or honeycomb cardboard and/or corrugated cardboard and/or corrugated paperboard and/or corrugated fiberboard and/or corrugated honeycomb cardboard and the shredably recyclable material includes PET and/or one or more thermoplastic material and/or one or more recycled plastic material.
According to further features in preferred embodiments the recyclable drivetrain includes a recyclable coupling apparatus operationally connecting at least one pulvably recyclable pedal to a pulvably recyclable wheel and shreddably recyclable hub arrangement.

More preferably, the recyclable coupling apparatus includes a crank arm operationally coupling the at least one pedal to the wheel and hub arrangement. Also more preferably, the recyclable coupling apparatus includes (a) a forward pinion operationally coupled to the at least one pedal; (b) an aft pinion operationally coupled to the wheel and hub arrangement; and (c) a timing belt operationally coupling the aft pinion to the forward pinion. Most preferably the timing belt includes a pulvably or shreddably recyclable material.

According to another aspect of the present invention there is provided a human powered land vehicle sufficiently rigid to transport a human rider and constructed only from pulvably recyclable and shreddably recyclable materials. Preferably the pulvably recyclable materials include cardboard and/or paperboard and/or fiberboard and/or honeycomb cardboard and/or corrugated cardboard and/or corrugated paperboard and/or corrugated fiberboard and/or corrugated honeycomb cardboard, and the shreddably recyclable material includes PET and/or one or more thermoplastic material and/or one or more recycled plastic material.

According to still further features in preferred embodiments the vehicle includes recyclable elements such as a frame and/or a fork and/or at least one wheel and/or a drivetrain and/or a sprocketed hub.

In keeping with the ever-improving efforts to cut down waste pollution and provide recyclable solutions, the current invention provides a fully recyclable bicycle that is cheaply constructed and capable of holding a significant weight. The embodiments described herein are merely exemplary as the invention can be applied to children's play vehicles, such as pedal-less scooters, tricycles and the like as well as double bicycles and other recreation vehicles.

The vehicle frame, fork, wheels and transmission system in the current embodiments are constructed from folded and styled honeycomb cardboard with components constructed from cardboard and/or polystyrene terephthalate (PET).

In order to achieve a higher resistance of the cardboard against external influences such as moisture, the cardboard can also be composed of flutes which are lined with plastic material and/or wax and/or impregnating agents, or the cardboard can subsequently be coated with plastic material upon production thereof.

The cardboard preferably is treated with either organic or inorganic (but preferably organic) sealant for waterproofing. The cardboard also undergoes flame resistant treatment. Both of these processes are known in the art.

The current invention not only provides a new vehicle design but also a paradigm shift in the use (and discarding) of such vehicles. The current invention is a cheaply manufactured, durable and totally recyclable product. In a field where even the most simple bicycles are expensive and not easily disposed of, there has long been a need for a cheaper alternative as well as one that is fully recyclable in keeping with the needs of a society that is on the one hand an aggressive consumer and on the other hand becoming more and more ecologically concerned.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Various embodiments are herein described, by way of example only, with reference to the accompanying drawings, wherein:

**FIG. 1** is a diagram of an embodiment of the invention;

**FIG. 2** is a diagram of the frame of an embodiment of FIG. 1;

**FIG. 3** is a diagram of the drivetrain and wheels of an embodiment of FIG. 1 with one of the pedals deleted;

**FIG. 4A** is a diagram of the rear hub of an embodiment of FIG. 1;

**FIG. 4B** is a diagram of one wheel of an embodiment of FIG. 1;

**FIG. 5** is a diagram of the fork of an embodiment of FIG. 1;

**FIG. 6** is a diagram of a coupling PET hinge of FIG. 1;

**FIG. 7** is a diagram of second embodiment of the invention;

**FIG. 8** is a diagram of the drivetrain of the second embodiment of the invention.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

The principles and operation of a recyclable cardboard bicycle according to the present invention may be better understood with reference to the drawings and the accompanying description.

Referring now to the drawings, FIG. 1 illustrates an assembled recyclable bicycle [A] featuring a frame [B] a pedal-crank drivetrain [C], a hub arrangement [D], wheels [E], fork [F] and hinge [G]. In addition a cardboard handlebar [La] is attached to for [F] and a cardboard seat [Lb] is detachably attached to frame [B]. The bicycle is constructed from honeycomb cardboard with cardboard and/or PET components. The bicycle as depicted is capable of supporting the weight of at least 200 Kg.

FIG. 2 illustrates the frame [B] of the embodiment of FIG. 1. The frame is formed by bending a linerboard sheet into a U-shaped construct with side boards [2a] of equal length and filled with honeycomb cardboard filler. The transverse U-shaped cross-section is designed to support a significant weight, equal to or more than the combined weight of two average size adult males. The frame features three square indentions [2bi, 2bii, 2biii] on its dorsal surface. A seat (not shown) features a corresponding square protrusion for detachably coupling to the frame. The seat can be attached to the frame at any of the indentations according to need. For example, a person with long legs will place the seat at indentation [2bii], thereby providing a raised sitting area. A shorter person would remove the seat from indentation [2biii], in order to be closer to the pedals and place it either at indentation [2bi] for improved aesthetics or at indentation [2biii] for an additional rider.

On the front of the frame, there is constructed a diamond shaped indentation [2c]. Here the bicycle frame [B] is mechanically coupled to the bicycle fork [F] via a PET hinge [G]. On each of the parallel side boards [2a] there are featured identical parallel cylindrical incisions [2d]. On the bottom left side of the frame is featured a U-shaped indentation [2e] where the frame rests on the rear hub [D] of the rear wheel [E] of the bicycle.

FIG. 3 depicts the drivetrain [C] of the embodiment of FIG. 1 with one of the pedals deleted. Two wheels [E] are also depicted. The pedals [3a] of the drivetrain are coupled together through the parallel apertures [2f] in the side boards [2a] via a cylindrical connecting element [M]. The pedals and
connecting element are held in place by two aperture fitting covers [3c] which are each positioned respectively on either side of the bicycle between the pedal and frame. Each pedal [3a] is coupled to a crank arm [3d]. Each crank arm [3d] is coupled to the rear hub [D] via offset cylindrical flanges [3f].

[0047] FIG. 4A is a diagram of the rear hub of the invention of FIG. 1. In FIG. 4A cylindrical flanges [3f] are mounted on left and right end caps [3e], protruding from the outer surfaces of the end caps [3e] and spaced away from the center of the end caps [3e] to allow sufficient rotation about the axis of rear hub [D]. Left and right end caps [3e] are connected via a cylindrical connecting element [3l]. A sprocket [3g] is mounted on the cylindrical connecting element [3l]. Sprocket protrusions [3g] fit into corresponding indentations [3h] (FIG. 4B) on the back and front wheels [E]. Back and front wheels [E] feature grooved rims [3k]. Grooved rims [3k] are filled with vulcanized silicone filler to provide solid tires. In the current embodiment, in order to simplify the manufacturing process, the front and rear hubs and wheels are identical in design and can therefore be used interchangeably. When pressure is applied alternately to pedals [3a] the drivetrain rotates along the axes of coupling element [3f] and rear hub [D] converting the reciprocating motion of the pedals into rotational motion.


[0049] Another preferred embodiment is shown in FIG. 7. FIG. 7 is an exploded view of bicycle [H], wherein is depicted a belt driven bicycle [H] where the drivetrain [I] is constructed from forward and aft pinion mechanisms [7b] which is engineered to be a teeth belt [7c] connecting the pedals [7a] to the rear sprocket [7d]. All the components of the drivetrain are constructed from PET and/or cardboard. All the other components of the embodiment of FIG. 7 are substantially as in the embodiment of FIG. 1.

[0050] FIG. 8 is a rear isometric view of the drivetrain of FIG. 7. The forward pinion [7b] is mounted on a hexagonal connecting piece [7f], via which the external pedals [7a] are coupled together. A timing belt [7c] couples the forward pinion [7b] to the aft pinion [7c]. The aft pinion is mounted adjacent to the rear sprocket [7d]. The rear sprocket [7d] fits into the corresponding indentations [3h] in the rear wheel [E]. The timing belt drivetrain converts the reciprocating motion of the pedals into rotational motion, rotating the aft wheel.

[0051] While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and other applications of the invention may be made. Therefore, the claimed invention as recited in the claims that follow is not limited to the embodiments described herein.

What is claimed is:
1. A human-powered land vehicle wherein said vehicle comprises:
   a. a frame; and
   b. at least one pulpably recyclable wheel and shreddably recyclable hub arrangement coupled to said frame; wherein said frame is propelled by a user of the vehicle by effecting a rotation of said at least one wheel and hub arrangement.
2. A vehicle of claim 1 wherein said pulpably recyclable wheel includes at least one material selected from the group consisting of:
   i. cardboard,
   ii. paperboard,
   iii. fiberboard,
   iv. honeycomb cardboard,
   v. corrugated cardboard,
   vi. corrugated paperboard,
   vii. corrugated fiberboard, and
   viii. corrugated honeycomb cardboard;
   and wherein said shreddably recyclable hub arrangement includes at least one material selected from the group consisting of:
   i. PET,
   ii. thermoplastics materials, and
   iii. recycled plastic materials.
3. A vehicle of claim 1 wherein said vehicle is a unicycle.
4. A vehicle of claim 1 wherein said vehicle is a bicycle.
5. A vehicle of claim 1 wherein said vehicle is a tricycle.
6. A human-powered land vehicle comprising:
   a. a pulpably recyclable fork; and
   b. at least one pulpably recyclable wheel and shreddably recyclable hub arrangement coupled to said pulpably recyclable fork;
7. A vehicle of claim 6 wherein said pulpably recyclable fork and wheel include at least one material selected from the group consisting of:
   a. cardboard,
   b. paperboard,
   c. fiberboard,
   d. honeycomb cardboard,
   e. corrugated cardboard,
   f. corrugated paperboard,
   g. corrugated fiberboard, and
   h. corrugated honeycomb cardboard.
8. A vehicle of claim 6 wherein said shreddably recyclable hub arrangement includes at least one material selected from the group consisting of:
   a. PET,
   b. thermoplastics materials, and
   c. recycled plastic materials.
9. A human-powered land vehicle comprising a recyclable drivetrain wherein said recyclable drivetrain includes at least one material selected from the group consisting of:
   a. pulpably recyclable material, and
   b. shreddably recyclable material.
10. A vehicle of claim 9 wherein said pulpably recyclable material includes at least one material selected from the group consisting of:
i. cardboard,
ii. paperboard,
iii. fiberboard,
iv. honeycomb cardboard,
v. corrugated cardboard,
vi. corrugated paperboard,
vii. corrugated fiberboard, and
viii. corrugated honeycomb cardboard;
and wherein said shreadably recyclable material includes at least one material selected from the group consisting of:
   i. PET,
   ii. thermoplastics materials, and
   iii. recycled plastic materials.
11. A vehicle of claim 10 wherein said recyclable drivetrain includes a recyclable coupling apparatus operationally connecting at least one pulvably recyclable pedal to a pulvably recyclable wheel and shreadably recyclable hub arrangement.
12. A vehicle of claim 11 wherein said recyclable coupling apparatus includes a crank arm operationally coupling said at least one pedal to said wheel and hub arrangement.
13. A vehicle of claim 11 wherein said recyclable coupling apparatus includes
   a. A forward pinion operationally coupled to said at least one pedal;
   b. an aft pinion operationally coupled to said wheel and hub arrangement; and
   c. A timing belt operationally coupling said aft pinion to said forward pinion.
14. A vehicle of claim 13 wherein said timing belt includes at least one material selected from the group consisting of:
   a. said pulvably recyclable material, and
   b. said shreadably recyclable material.
15. A human powered land vehicle sufficiently rigid to transport a human rider and constructed only from pulvably recyclable and shreadably recyclable materials.
16. A vehicle of claim 15 wherein said pulvably recyclable material includes at least one material selected from the group consisting of:
   i. cardboard,
   ii. paperboard,
   iii. fiberboard,
   iv. honeycomb cardboard,
   v. corrugated cardboard,
   vi. corrugated paperboard,
   vii. corrugated fiberboard, and
   viii. corrugated honeycomb cardboard;
and wherein said shreadably recyclable material includes at least one material selected from the group consisting of:
   i. PET,
   ii. thermoplastics materials, and
   iii. recycled plastic materials.
17. A vehicle of claim 16 wherein said vehicle includes recyclable elements selected from the group consisting of:
   a. a frame;
   b. a fork;
   c. at least one wheel;
   d. a drivetrain; and
   e. a sprocketed hub arrangement.
18. A vehicle of claim 1 wherein said vehicle is a scooter.