CLAIMS

1. A gear mechanism for a pedal-powered vehicle, the gear mechanism comprising:

a gear arrangement; and

a spindle arrangement configured to support the gear arrangement, the spindle arrangement comprising a first spindle, a second spindle, a third spindle and a fourth spindle,

wherein the gear arrangement of concentric gears comprises:

a first set of gears mounted on the first spindle and the fourth spindle, the first set of gears being arranged to be driven via a first pedal of the pedal-powered vehicle;

a second set of gears mounted on the second spindle and the fourth spindle, the second set of gears being arranged to be driven via a second pedal of the pedal-powered vehicle; and

a third set of gears mounted on the third spindle and the fourth spindle,

wherein, for each of the first and second sets of gears, the set of gears is configured to be alternately driven, via the corresponding pedal being rotated through less than 180°, in a power stroke to drive the third set of gears for propelling the pedal-powered vehicle, and, advanced, via the corresponding pedal being rotated through more than 180°, in a return stroke to commence a subsequent power stroke; and

wherein the first set of gears comprises:

a first pair of partial gears comprising:

a first partial gear, that has teeth on the circumference subtending an angle of less than 180°, mounted on the first spindle: and

a second partial gear mounted on the fourth spindle,

wherein the first and second partial gears are arranged to engage each other in the power stroke associated with the first set of gears; and

a second pair of partial gears comprising:

a third partial gear, that has teeth on the circumference subtending an angle of more than 180°, mounted on the first spindle; and

a fourth partial gear mounted on the fourth spindle,

wherein the third and fourth partial gears are arranged to engage each other in the return stroke associated with the first set of gears.

2. The gear mechanism as claimed in claim 1, wherein the first spindle, the second spindle and the third spindle are arranged along a first axis, and wherein the fourth spindle is arranged along a second axis.

3. The gear mechanism as claimed in claim 2, wherein the first spindle, the second spindle and the third spindle are arranged side-by-side.

4. The gear mechanism as claimed in claim 2, wherein one of the first spindle and the third spindle is arranged rotatable about the other of the first spindle and the third spindle.

5. The gear mechanism as claimed in any one of claims 1 to 4, wherein the third spindle is adapted to be arranged independently of crank arms of the pedal-powered vehicle.

6. The gear mechanism as claimed in any one of claims 1 to 5, wherein the second set of gears comprises:

a first pair of partial gears comprising:

a first partial gear mounted on the second spindle; and

a second partial gear mounted on the fourth spindle,

wherein the first and second partial gears are arranged to engage each other in the power stroke associated with the second set of gears; and

a second pair of partial gears comprising:

a third partial gear mounted on the second spindle; and

a fourth partial gear mounted on the fourth spindle,

wherein the third and fourth partial gears are arranged to engage each other in the return stroke associated with the second set of gears.

7. The gear mechanism as claimed in any one of claims 1 to 6, wherein the third set of concentric gears comprises:

a first full gear mounted on the third spindle; and

a second full gear mounted on the fourth spindle,

wherein the first and second full gears are arranged to engage each other for propelling the pedal-powered vehicle.

8. The gear mechanism as claimed in any one of claims 1 to 7, wherein each of the first, second and third sets of gears comprises a plurality of circular gears.

9. The gear mechanism as claimed in any one of claims 1 to 8, wherein, for each of the first and second sets of gears, the set of gears is configured to be alternately driven in the power stroke via the corresponding pedal being rotated through 160°, and advanced in the return stroke via the corresponding pedal being rotated through 200°.

10. The gear mechanism as claimed in any one of claims 1 to 9, wherein, for each of the first and second sets of gears, the set of gears is configured to be driven in the power stroke to drive the third set of gears to rotate the third spindle through 180°.

11. The gear mechanism as claimed in any one of claims 1 to 10, further comprising a chain wheel mounted on the third spindle.

12. The gear mechanism as claimed in any one of claims 1 to 11, wherein, for each of the first and second sets of gears, the set of gears is configured, in the power stroke, to drive the third set of gears for propelling the pedal-powered vehicle at a constant wheel speed.

13. The gear mechanism as claimed in any one of claims 1 to 12, further comprising a support structure to support the gear arrangement and the spindle arrangement.

14. A pedal-powered vehicle comprising the gear mechanism as claimed in any one of claims 1 to 13.

15. The pedal-powered vehicle as claimed in claim 14, wherein the pedal-powered vehicle comprises:

a first pedal, and a first crank arm coupling the first pedal to the first spindle; and

a second pedal, and a second crank arm coupling the second pedal to the second spindle.

16. The pedal-powered vehicle as claimed in claim 15, wherein the third spindle is arranged independently of the first and second crank arms.

17. The pedal-powered vehicle as claimed in any one of claims 14 to 16, wherein the pedal-powered vehicle comprises a bicycle.

18. A method for forming a gear mechanism for a pedal-powered vehicle, the method comprising:

supporting a concentric gear arrangement on a spindle arrangement, comprising:

mounting a first set of gears of the gear arrangement on a first spindle of the spindle arrangement and a fourth spindle of the spindle arrangement, the first set of gears being arranged to be driven via a first pedal of the pedal-powered vehicle;

mounting a second set of gears of the gear arrangement on a second spindle of the spindle arrangement and the fourth spindle, the second set of gears being arranged to be driven via a second pedal of the pedal-powered vehicle; and

mounting a third set of gears of the gear arrangement on a third spindle of the spindle arrangement and the fourth spindle,

wherein, for each of the first and second sets of gears, the set of gears is configured to be alternately driven, via the corresponding pedal being rotated through less than 180°, in a power stroke to drive the third set of gears for propelling the pedal-powered vehicle, and, advanced, via the corresponding pedal being rotated through more than 180°, in a return stroke to commence a subsequent power stroke, and

wherein the first set of gears comprises:

a first pair of partial gears comprising a first partial gear, that has teeth on the circumference subtending an angle of less than 180° and a second partial gear; and

a second pair of partial gears comprising a third partial gear, that has teeth on the circumference subtending an angle of more than 180° and a fourth partial gear,

wherein mounting the first set of gears comprises:

mounting the first partial gear on the first spindle, and mounting the second partial gear on the fourth spindle, wherein the first and second partial gears are arranged to engage each other in the power stroke associated with the first set of gears; and

mounting the third partial gear on the first spindle, and mounting the fourth partial gear on the fourth spindle, wherein the third and fourth partial gears are arranged to engage each other in the return stroke associated with the first set of gears.