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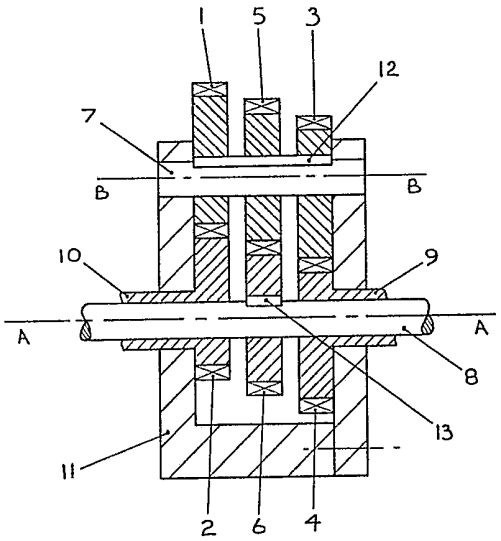
(54) A drive mechanism for converting constant velocity rotary to rotary motion having cyclic variations of velocity ratio or vice-versa

(57) The mechanism consists of three meshing pairs of gears, (1&2), (3&4), (5&6), all having the same number of teeth and diametral pitch. The gears, mounted on two parallel axes (AA&BB), form a planetary gear system. The three planet gears (1, 3&5) on the minor axis of rotation (BB) are all keyed to a common shaft (7) via a key (12). The three sun gears (2,4 & 6) on the major axis of rotation (AA) are independent of each other and are interconnected only via their respective planet gear (1, 3&5).

One pair of the aforementioned gears (5&6) is conventional in form its function being to reference the orientation of the system via the sun gear (6), key (13), and fixed shaft (8).

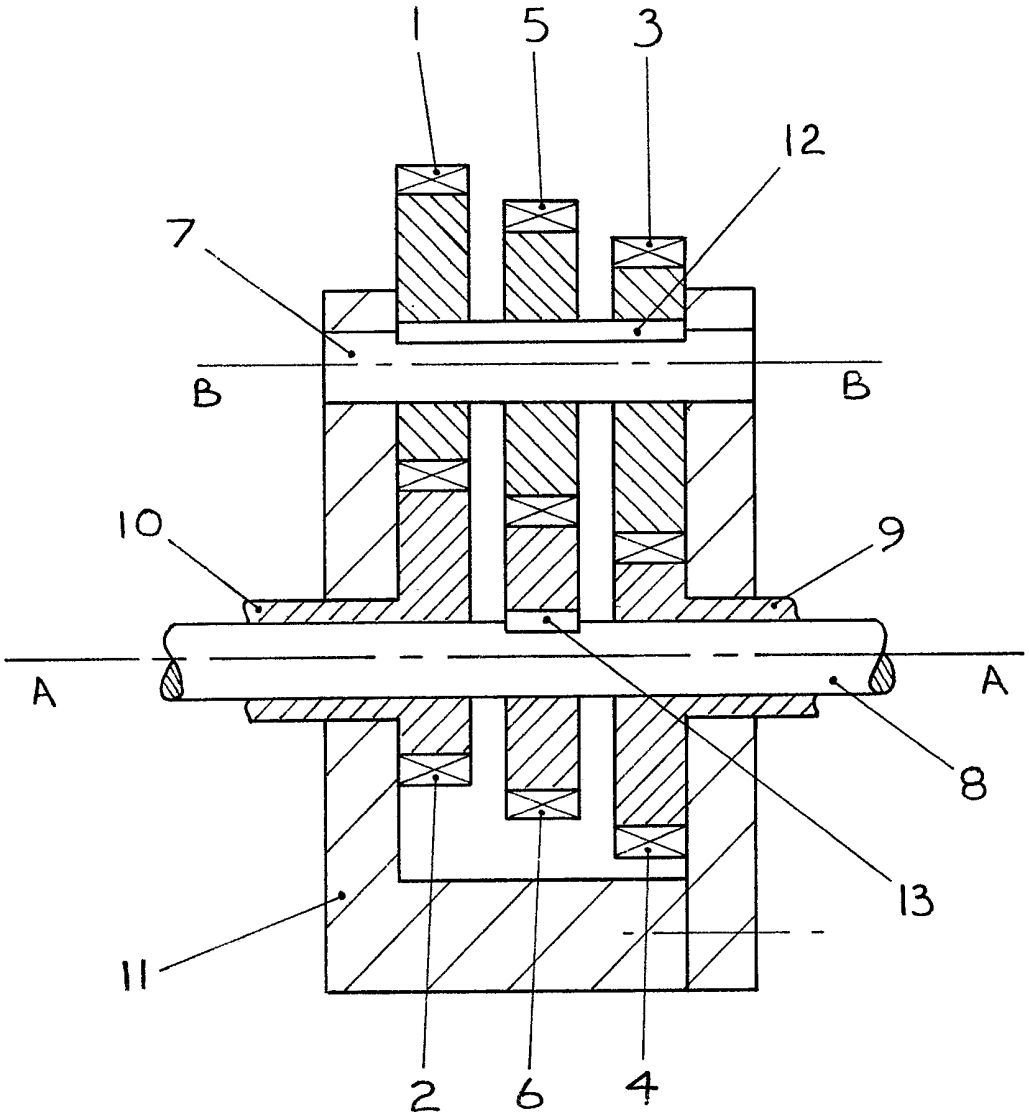
The remaining two gear pairs (1&2) (3&4) are composed of complimentary pairs of eccentrically mounted oval gears.

The whole planetary system is supported in a cage (11) which is rotatable about the main axis (AA).



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SPECIFICATION

A drive mechanism for co-axially converting rotary to reciprocating motion or vice-versa

This invention relates to a kinematic drive mechanism suitable for alternating machinery, particularly but not exclusively, for manpowered machinery or the like, such as the bicycle.

As is known existing methods of reciprocating to rotary motion conversion are by the use of link, cam or indexing devices, none of which lend themselves to maximum ergonomic effectiveness in the case of manpowered machinery or to being readily linked to subsequent gearing.

According to the present invention there is provided a coaxial method of receiprocating to rotary conversion suitable for the wheel of a bicycle or the like, and consisting of three meshing pairs of spur gears with all gears having the same number of teeth and diametral pitch. The gears are mounted on two parallel axes to form a planetary gear system.

The three follower gears, mounted on the minor axis of rotation are independent of each other and connected only via their respective follower gears.

One pair of the aforementioned gears is conventional in form its function being to reference the orientation of the system via the driver gear, key, and shaft which are fixedly connected to the frame of the machine which is driving or being driven.

The remaining two gear pairs are composed of complimentary pairs of cam gears. Each gear is oval or near oval and is rotated at a point along its major axis at a set distance from its geometric centre.

Initially both the gears of the first pair are meshed, their geometric centres and their relative axes of rotation being aligned and similarly orientated; those of the second pair are aligned and orientated in the same manner but in the opposite direction.

The orientation of the second pair of spur gears in relation to the first pair of gears is variable.

The whole planetary system is supported in a cage on the main axis of rotation.

For better understanding of the present invention and to show how the same may be carried into effect, reference will now be made by way of example to the accompanying single figure drawing which shows in vertical section a view through a kinematic drive mechanism according to the invention.

As shown in the drawing, the kinematic drive mechanism of the invention for manpowered machinery or the like, includes three meshing pairs of spur gears (1&2) (3&4) (5&6) with all gears having the same number of teeth and diametral pitch. The gears mounted on two parallel axes (AA&BB) form a planetary gear system. The three follower gears (1,3&5) on the minor axis of rotation (BB) are all keyed to a common shaft (7) via a key (12). The three driver gears (2,4&6) on the major axis of rotation (AA) are independent of each other and interconnected only via their respective follower gears (1,3&5).

One pair of the aforementioned gears (5&6) is conventional in form its function being to reference the orientation of the system via the driver gear (6), key (13) and shaft (8) which are fixedly connected to the frame of the machine which is driving or being driven.

The remaining two gear pairs (1&2) (3&4) are composed of complimentary pairs of cam gears. Each gear is oval or near oval and is rotated at a point along its major axis at a set distance from its geometric centre.

Initially both the gears of the first pair (1&2) are meshed, their geometric centre and their relative axes of rotation being aligned and similarly orientated; those of the second pair (3&4) are aligned and orientated in the same manner but in the opposite direction.

The orientation of the second pair of gears (1&2) in relation to the first pair of gears (3&4) is variable.

The whole planetary system is supported in a cage (11) pivoted on the main axis of rotation (AA).

Constant rotation of the cage (11) around the main axis (AA) with the reference gear (6) fixedly connected to a reference frame via shaft (8), causes the follower reference gear (5) to rotate at a constant rate and thus the follower cam gears (1&3) also rotate at a constant rate, being fixedly connected to the reference gear (5).

Due to the modified profile of the cam gears (1&3) their constant rotation is not transferred to their mating driver gears (2&4), but oscillations are transferred.

The whole system is reversible and thus oscillating the driver cam gears (2&4) produces rotation of the cage (11).

For use in manpowered machinery, pedals or levers would be fixedly attached to the driver gears (2&4) via shafts (9&10) and the driven part, such as the wheel of a bicycle, would be attached either directly or through subsequent gearing to the cage (11) or followr gear (5) of the system.

CLAIMS

1. A kinematic drive mechanism being a planetary gear system on two parallel axes on which are mounted three pairs of gears, all having the same number of teeth, of which the three follower gears are fixedly connected to each other and the three driver gears are independent of each other and of which one pair of gears are for referencing the system about the main axis and the other two pairs are complimentary pairs of cam gears, with each gear being oval or near oval and pivoted at a point along its major axis at a set distance from its geometric centre, therewith a cage supporting the whole system which when rotated about the main axis with the reference driver gear static, causes the driver cam gears to alternate, the whole system being reversible.

2. A mechanism according to claim 1 including a central shaft attachable to a frame, thereby referencing and pivoting the planetary system, and around which the input and output drives are pivoted.

3. A mechanism according to claim 2 in which the cam drive gears are arranged to act alternately, in response to pivotal movement of levers or gearing

when connected thereto, to an angular displacement predetermined in the design of the cam gears themselve.

4. A mechanism according to claims 2 or 3 which produces rotation of the support cage in either direction in response to the alternation of the two cam drive gears of vice-versa.

5. A mechanism according to any one of claims 2 to 4 in which the drive cam gears are pivotally carried on the central shaft so that a respective drive member may be attached to the respective gear or coupling shaft, such that the cam drive gears are meshing with their respective planetary follower gear which is mounted on the minor axis and supported by a cage which is pivoted on the main axis of rotation thus forming a planetary gear system.

6. A mechanism according to any one of claims 1 to 5 wherein the centre of oscillation of the cam drive gears or connected components is governed by planetary gearing as herebefore described in claim 1.

7. A kinematic drive mechanism as hereinbefore described with reference to the accompanying drawing.

8. A machine or manpowered machine having a kinematic drive mechanism according to claim 1, substantially as hereinbefore described with reference to the accompanying drawing.

9. A mechanism according to any one of the claims 1 to 8, the use of complimentary pairs of multilobed cam gears as hereinbefore described or otherwise, in a planetary configuration to convert rotary to reciprocating motion or vice-versa.

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