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DIRECTIONAL FORCE GENERATOR

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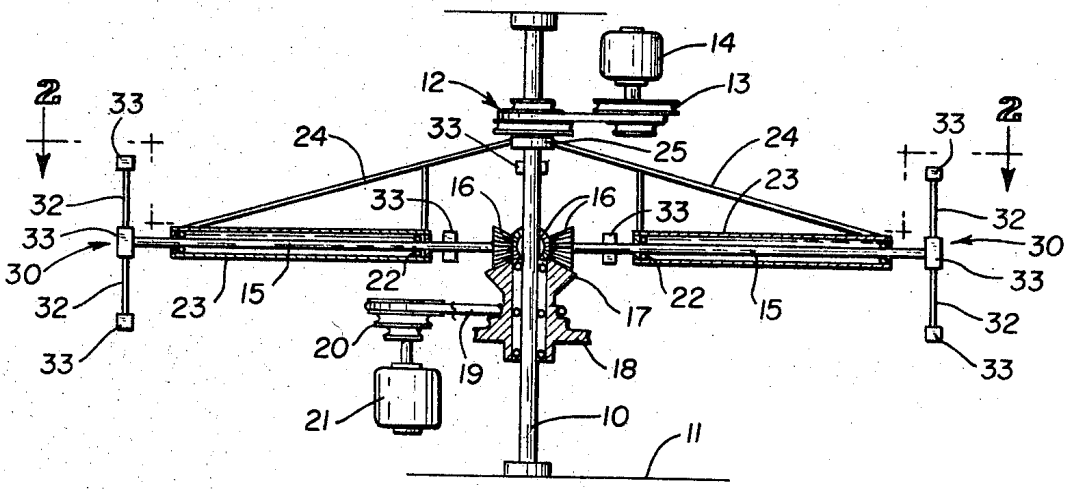

Fig_1

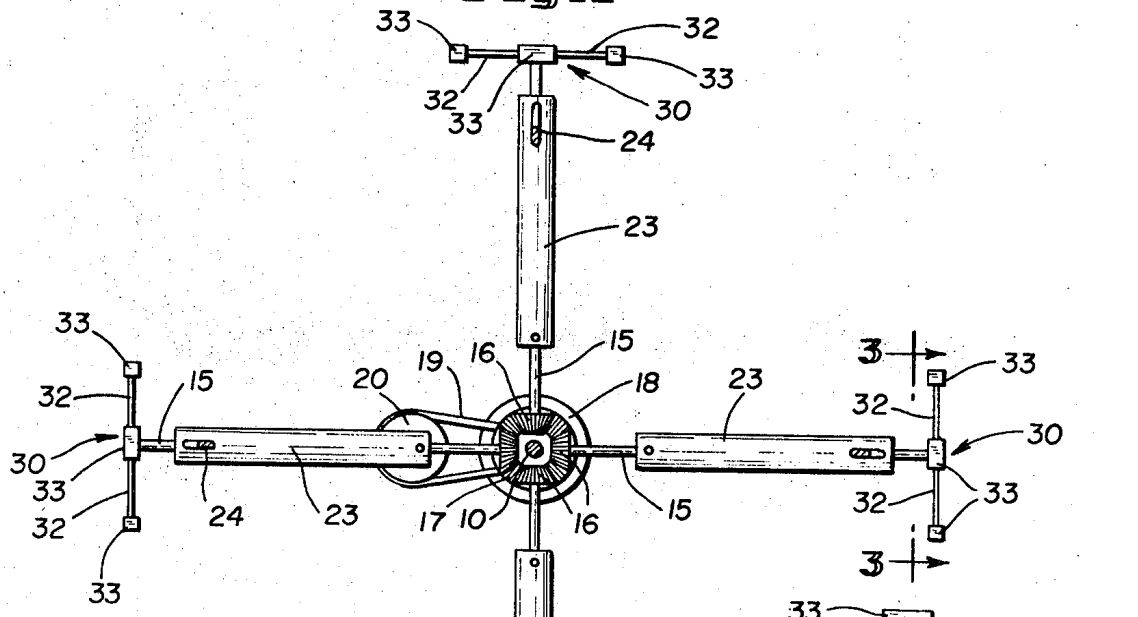

Fig_2

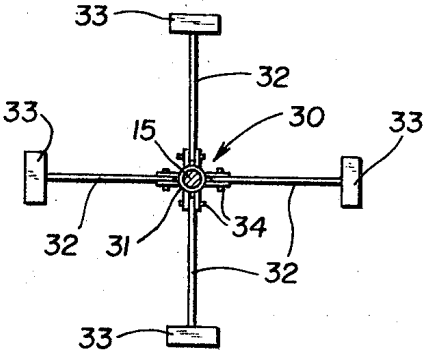

Fig_3

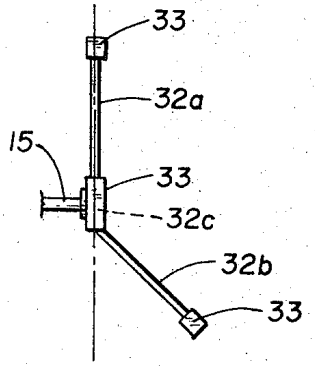

Fig_4

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DIRECTIONAL FORCE GENERATOR

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ABSTRACT OF THE DISCLOSURE

A directional force generator comprising mechanism which utilizes centrifugal and gyratory action for moving a wheeled vehicle, boat or aircraft, on which the generator is mounted, in a predetermined direction, without other propelling or lifting means.

The mechanism comprises one or more rotated shafts swingable about a rotated main shaft, each swingable shaft being provided on its outer end with a head having one or more pivotally mounted weighted arms movable independently of each other. When the head is simultaneously rotated by the swingable shaft about the axis of the swingable shaft and bodily moved in a circular path around the main shaft, both centrifugal and gyratory influences function to cause the pivotally mounted arms to move out of an angularly balanced plane of rotation into an angularly unbalanced and constantly changing plane of rotation. The natural forces which resist movement of the rotating arms out of their balanced plane of rotation result in moving the generator, and mechanism on which it is mounted, in predetermined directions depending on the direction of rotation of the swingable shafts and heads.

This invention relates to a directional force generator which may be embodied in a vehicle such as a wheeled vehicle, boat, or aircraft, for the purpose of moving the vehicle in a predetermined direction without the use of other propelling or lifting means.

The object of the invention is to produce mechanism for the purpose stated in which an unbalanced condition of weighted arms pivotally mounted on a rotated shaft results from rotation of such a shaft about its axis coupled with travel of the swingable rotated shaft and its pivotally mounted arms about the axis of a main shaft which preferably is perpendicular to the swingable shaft; and to utilize the effort of natural forces to equalize the unbalanced condition thus produced for the purpose of moving the vehicle in predetermined directions.

One or more swingable shafts, each provided on its outer end with a head having one or more arms pivotally mounted thereon, may be utilized. When not influenced by swinging of the rotated shafts around the axis of the main shaft, the arms rotate with the shaft under influence of centrifugal force in a plane perpendicular to the axis of the shaft on which they are mounted. This is a single plane of rotation, in which the weighted arms extend from the head on the rotated shaft in directions which are angularly balanced and perpendicular to the shaft. When the swingable shaft is bodily moved in a circular path around the main shaft by rotation of the main shaft, the arms of the head on the swingable shaft are thus moved into a different plane of rotation, and this change of location of the plane of rotation results in the pivotally mounted arms assuming positions which are angularly balanced relatively to the shaft on which they are mounted but not perpendicular to the shaft. The combined result of the two described simultaneous rotary motions, namely, the rotation of of the pivoted arms with the swingable shaft about the axis of the shaft, coupled with the rotation of the swingable shaft and head in a circular path around the main shaft, is that the pivotally

mounted arms extend in directions angularly unbalanced relatively to the shaft on which they are mounted while they are being carried into constantly changing planes of rotation by the described mechanism.

The natural forces which develop to resist this out-of-balance position of the arms cause the generator and mechanism on which it is mounted to move in a predetermined direction depending on the direction of rotation of the swingable shafts and heads.

The objects and advantages of the invention will be apparent from the drawings and following specification.

In the drawings:

FIG. 1 is an elevational side view, partly in section, of a directional force generator embodying my invention.

FIG. 2 is a top plan view, partly in section, in the plane of the line 2—2 of FIG. 1.

FIG. 3 is an elevational view, partly in section, in the plane of the line 3—3 of FIG. 2.

FIG. 4 is an elevational side view of the head construction of FIG. 3, showing one of the arms in an unbalanced position.

The embodiment of the invention shown in the drawings comprises a main shaft **10** rotatably mounted in a frame indicated at **11**. For convenience in describing the mechanism, the shaft **10** will be assumed to be vertically disposed, but the apparatus as a whole may be tiltable in its mounting on a vehicle (not shown) or relatively thereto. The main shaft **10** has fixed thereon by any suitable means (one example of which may be the variable speed pulley **12** shown) operatively connected to pulley **13** on the shaft of a motor **14**. The latter is mounted in the frame by any suitable means (not shown).

Extending radially, preferably at right angles to the main shaft **10**, are swingable shafts **15** each consisting of two axially aligned sections spaced apart at their inner proximate ends to accommodate pinions **16** mounted thereon. Other types of gearing may be used. As shown in FIG. 2, two such shafts **15** each consisting of two axially aligned sections are embodied in this example of the mechanism, but one or more could be used. The pinions **16** mesh with a gear **17** connected to pulley **18** operatively connected by belt **19** or other means to the pulley **20** fixed on the shaft of the motor **21**, also suitably mounted in frame **11**. A single motor, operatively connected to the main shaft **10** and swingable shaft or shafts **15**, may be used in place of the two motors shown in the drawings. In the embodiment shown, the gear **17** and pulley **18** are loosely mounted on the main shaft **10**. Motor **21** thus rotates the shafts **15** about their axes.

The shafts **15** are rotatably supported in bearings **22** and extend through tubular carriers **23** which are mounted in carrier struts **24** connected to a collar **25** fixedly mounted on the main shaft **10**. Rotation of shaft **10** thus rotates the collar **25**, causing swinging or travel in circular paths of the carriers **23–24**, and of the shafts **15** carried thereby.

A head indicated as a whole at **30** is mounted on the outer end of each shaft **15**. Each head comprises a hub **31** fixedly surrounding shaft **15**, and one or more arms **32** equally circumferentially spaced apart, each having a weight **33** on its outer free end, pivotally connected at its inner end to the hub **31** as indicated at **34** and movable independently of each other. The heads **30** rotate with the shafts **15**.

The arms **32** of the head **30** are alike. When the shafts **15** are rotated by motor **21** (and motor **14** is not operating) the weighted arms move under centrifugal force to positions perpendicular to the shaft **15** on which they are mounted and rotate in a single plane. When the motor **14** is energized, the carrier members **23**, **24**, and the rotated shafts **15** swing around the shaft **10**, causing each head **30** to rotate in constantly changing planes of rotation in which the arms extend in directions

which are angularly balanced relatively to the shaft **15** but not perpendicular thereto.

This changing of the planes of rotation of the arms **32** of each head **30** forced by the swinging or turning of the shafts **15** around the main shaft **10** is resisted by the arms **32** in accordance with gyroscopic principles. When the shafts **15** are rotated while being swung or turned in one direction around shaft **10**, the arm **32** of each head which reaches the upwardly extending position of **32***a* in FIG. 4 moves inwardly toward the shaft **10**, and the arm **32** which reaches the downwardly extending position of **32***b* in FIG. 4 moves outwardly away from the shaft **10** by gyroscopic action. Simultaneously, centrifugal forces also act on the arms **32** due to rotation of the carriers and shafts **15**, causing the arms **32***a* to move away from shaft **10** back toward a nearly perpendicular position relatively to shaft **15**, while arms **32***b* move further outwardly from shaft **10** by the same centrifugal force so that the arms assume the positions shown in FIG. 4. Thus the arms extend at unequal angles relatively to shaft **15**. This is an unbalanced condition of the arms which natural forces seek to correct by causing the hub **31** to move up toward arm **32***a*. This effort to overcome the unbalance resulting from enforced movement of the arms **32** out of their centrifugally influenced single plane of rotation has the effect of moving the vehicle upwardly when the arms are in the FIG. 4 position. When the shafts **15** are swung to travel in the opposite direction, the movements of the arms **32** are reversed, and the arm **32***a* moves outwardly away from the shaft **10** and the arms **32***b* move inwardly toward the shaft **10**, by gyroscopic action. Simultaneously, centrifugal forces acting on the heads **30** move the arms **32***b* away from the shaft **10** back toward a near perpendicular position relatively to shaft **15**, while arms **32***a* move further outwardly from shaft **10**.

The out of balance condition caused by the arms **32***a* and **32***b* is compensated by movement of the hubs of the heads **30** in the direction of arms **32***a* when carriers are swinging in one direction, and in the direction of arms **32***b* when the carriers are swinging in the opposite direction. The combined action of all the heads causes the entire machine to move in the direction of shaft **10** in the direction of the arm which has its weighted end the greatest distance from shaft **15**. The resultant force exerted by each head **30** is not parallel to the shaft **10**, but the average of the forces exerted by heads is in the direction of the shaft **10**.

The intermediate arms **32**, by which is meant the arms which assume the positions between arms **32***a* and **32***b* during the rotation of the heads **30**, are neutral so far as lifting or depressing action are concerned, but the swinging or turning of the carriers and the shafts **15** around the shaft **10** causes the leading one of the arms of each head to be drawn away from shaft **10** and the trailing one toward the shaft **10**. This movement requires the heads and arms to rotate in constantly changing planes of rotation which is resisted in accordance with gyroscopic principles, causing movement of the apparatus as a whole in a given direction depending on the direction of rotation of the shafts **15** and of the carriers and shafts **15** about the shaft **10**.

It will be understood that if rotor **21** is idle, and motor **14** is operating, the pinions **16** are rotated by reason of their meshing with gear **17**, thereby also rotating shafts **15** which carriers **24** are being swung about axis of shaft **10**. Thus in one direction of rotation of shaft **10**, the rotary speed of pinions **16** is added to the speed of motor **14** while in the opposite direction of rotation of shaft **10**, the rotary speed of pinions **16** is subtracted from speed of motor **14**. As previously stated, a single motor operatively connected to the shafts **10** and **15**, may be substituted for the two motors and gearing shown herein.

Changes may be made in details of construction and in the form and arrangement of parts without departing from the invention. Weights and proportions of parts will be varied, depending on required speeds and uses of the mechanisms on which the generator is mounted.

I claim:

1. A directional force generator which comprises a rotated head having a plurality of independently movable members which are movable from balanced positions in a single plane of rotation to unbalanced positions in changing planes of rotation when the head is simultaneously rotated about its axis and moved bodily around a center, means for rotating the head and means for moving the rotating head around a center.

2. The generator defined by claim **1**, in which head comprises a hub mounted on a rotated shaft, and arms pivotally mounted and equally circumferentially spaced on the hub, said arms extending radially from the hub and movable independently into and out of positions perpendicular to the hub.

3. The generator defined by claim **1**, in which the independently movable members are weighted arms pivotally mounted on a rotated shaft.

4. A directional force generator for moving a vehicle in a predetermined direction comprising:

(a) a main shaft,

(b) a swingable shaft which extends axially at an angle to the main shaft and is swingable about said main shaft,

(c) means for rotating the swingable shaft,

(d) means for rotating the main shaft and swinging the swingable shaft around the main shaft, and

(e) a head on the outer end of the swingable shaft which has a plurality of independently movable arms rotatable in a single plane which extends transversely of and perpendicular to the axis of the swingable shaft when the swingable shaft is rotated about its own axis, and rotatable in constantly changing planes which extend at unequal angles to the swingable shaft when the head is simultaneously rotated and carried in a circular path around the main shaft, thereby producing an unbalanced condition causing the generator to move in a predetermined direction depending on the direction of rotation of the swingable shaft and head.

5. The generator defined by claim **4**, in which the head on the outer end of the swingable shaft comprises a hub and the plurality of pivotally mounted weighted arms are equally spaced apart circumferentially of the hub and movable independently of each other.

6. The generator defined by claim **4**, in which the means for rotating the main shaft and swinging the swingable shaft around the main shaft comprises a carrier mounted on the main shaft to rotate therewith, a motor, and operative connections between the motor and main shaft, said swingable shaft being rotatably mounted in the carrier.

7. The generator defined by claim **4**, in which the swingable shaft comprises two axially aligned longitudinally spaced apart sections.

8. The generator defined by claim **4**, in which the means for rotating the swingable shaft includes gearing on the swingable shaft and a gear loosely mounted on the main shaft in meshing engagement with said gearing on the swingable shaft.

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