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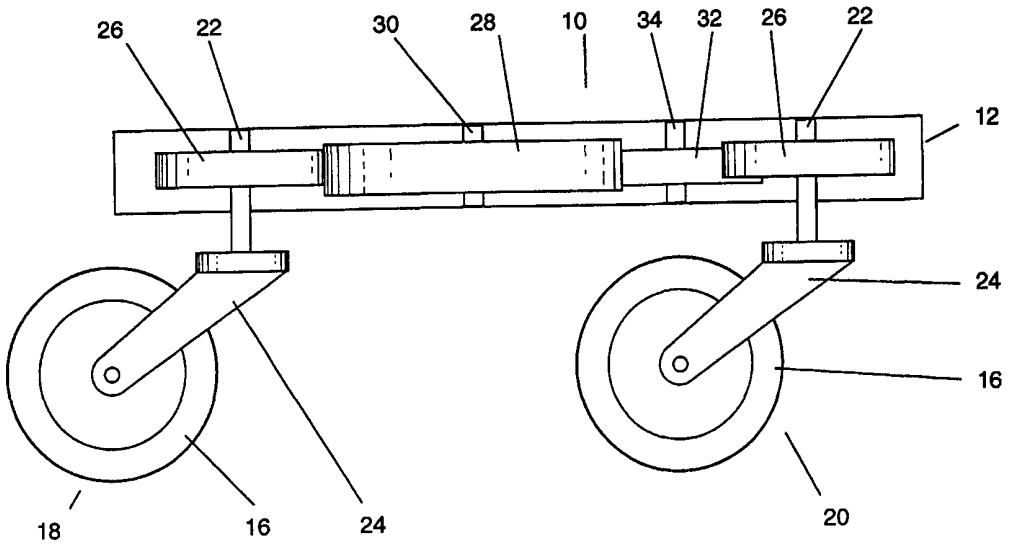
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(54) Title: STEERING SYSTEM



(57) Abstract

A vehicle (10) having a plurality of spaced–apart wheels (16), each wheel (16) being attached to the vehicle (10) by means of an axle (22), there being a separate axle (22) for each wheel (16), each axle having a longitudinal axis; the arrangement being such that rotation of one axle (22) about its longitudinal axis will cause the wheel (16) mounted thereon to change direction relative to the vehicle (10), each axle (22) having attached thereto a driven means (26), each driven means (26) being adapted to be driven by a drive means (28, 32) such that rotation of one axle (22) causes all other axles (22) to also rotate about their longitudinal axis.

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STEERING SYSTEM

Field of the Invention

This invention relates to a steering system and refers particularly, but not exclusively, to a steering system for wheeled vehicles or articles providing for steering of the wheels of the vehicle.

Throughout this specification reference to a vehicle intended to be propelled by human effort rather than motive power and is to be taken as to including any such article having wheels enabling it to move. This would include, for example, trolleys, carts, shopping trolleys, perambulators, wheel barrows, strollers, toy prams, trailers, caravans, boat trailers, wheeled jacks for vehicles, wheel chairs, gurnies, hospital beds, hospital stretchers mounted on a wheeled base, work platforms, library trolleys, and other similar articles having a number of wheels and/or castors.

Throughout this specification, reference to a wheel or wheels is to be taken as including a reference to a castor or castors, or a wheel acting as a castor.

Background of the invention

Many vehicles (as defined above) have a plurality of wheels (as defined above) which are independently mounted on an axle relative to the vehicle such that the wheel can rotate relative to the axle to enable the vehicle to be moved, including around corners. In many instances, the wheels operate independently. Good examples are work trolleys and shopping trolleys. In many instances this makes it difficult to use the vehicle as a knock or slight damage to the axle or the wheel can cause a particular wheel to be off-line and therefore act as a brake when moving the vehicle. Furthermore, when passing the vehicle over a slope, particularly a lateral slope, the vehicle will tend to follow the slope. Numerous

examples of loaded shopping trolleys rolling sideways down hills or driveways in parking lots have been recorded!

It is also quite often difficult for these vehicles to be negotiated around tight corners, particularly when space is at a minimum. This is because of the independent nature of the wheels - some movement must occur before the wheels will track correctly to enable proper turning to occur.

It is therefore the principal object of the present invention to provide a steering system for vehicles (as hereinbefore defined) which will enable a steering system for the wheels to be utilised.

Brief summary of the invention

With the above and other objects in mind the present invention provides a vehicle (as hereinbefore defined) having a plurality of spaced-apart wheels (as hereinbefore defined), each wheel being attached to the vehicle by means of an axle, each axle having a longitudinal axis, there being a separate axle for each wheel; the arrangement being such that rotation of one axle about its longitudinal axis will cause the wheel mounted thereon to change direction relative to the vehicle, each axle having attached thereto a driven means, each driven means being adapted to be driven by a drive means such that rotation of one axle causes all other axles to also rotate about their longitudinal axis.

Preferably, the driven means is a gear. Preferably, the drive means is a gear system. Alternatively, the drive means may be a chain or belt drive.

Advantageously, a spring tensioning means is provided so as to maintain appropriate contact between the drive means and each of the gears. More preferably, there is also provided a centralising device.

Preferably, when the drive means is a gear system, the gear system includes a central gear which is in engagement with two of the gears, and which engages the others of the gears by means of intermediate gears. Preferably, the two gears in direct contact with the central gear are at the one end of the vehicle. By use of intermediate gears, the other gears will cause their axles to rotate in the opposite direction to the gears in direct engagement with the central gear.

It is preferred that the wheels are arranged as a front pair of wheels and a rear pair of wheels, the front pair of having their gears being driven by direct engagement with the central gear. Alternatively, the front pair of wheels are adapted to be driven by the chain or belt drive so the rotation of one of the front pair of wheels will cause the other of the front pair of wheels to change into the same direction, the other wheels turning in the opposite direction.

Brief description of drawings

In order that the present invention may be fully understood there shall now be described by way of non limitative example only two preferred constructions of steering systems for vehicles incorporating the principal features of the present invention, the description being with reference to the accompanying illustrative drawings in which:

Figure 1 is a schematic side view of a first embodiment;

Figure 2 is a schematic top plan view of the a second embodiment;

Figure 3 is a schematic front end view of the vehicle of Figure 2;

Figure 4 is a schematic top plan view of a third embodiment of the present invention;

Figure 5 is a schematic top plan view of a fourth embodiment of the present

invention;

Figure 6 is a schematic top plan view of a variation of the embodiment of Figure 5; and

Figure 7 is a schematic top plan view of a further variation of the embodiment of Figure 5.

Description of Preferred Embodiments

To refer to the embodiment of Figure 1, there is a shown a vehicle which is generally designated as 10. The vehicle has a body 12, and which is intended to be pushed or otherwise driven by means of a handle (not shown), or by a load on the vehicle. The body 12 has four wheels 16, all substantially identical, although this is not of necessity always so. The wheels 16 are arranged as a front pair 18 of wheels 16 and a rear pair 20 of wheels 16. Each wheel 16 is mounted to the body 12 of vehicle 10 by means of an axle 22, each axle 22 being separate. Each wheel 16 is attached its axle 22 by a mounting bracket 24 so that the wheels 16 all act as a castor. To each axle 22 is securely mounted a gear 26, the gear 26 preferably being mounted within body 12, although it may be above or below body 12. Each gear 26 does not directly engage any other gear 26. It is preferred that each gear 26 be a full 360° gear so that the axles 22 can rotate through 360°, thus enabling each wheel 16 to be able to proceed in any direction.

Also mounted within body 12 by an axle 30 is a central gear 28. Again, gear 28 may be located within, above or below body 12. Central gear 28 directly engages each of the gears 26 of the front pair 18 of wheels 16. Therefore, rotation of axle 22 of at least one of the wheels 16 of front pair 18 will cause the relevant gear 26 to rotate with the axle 22. That will cause central gear 28 to rotate. Therefore, the other gear 26 of the other wheel 16 of the front pair 18 will also rotate. By virtue of the arrangement, the rotation of the two front gears 26 will be in the same

rotational direction and thus each wheel 16 of the front pair 18 wheels 16 will point in the same direction. If the two front gears 26 are substantially identical, wheels 16 of the front pair 18 will both point in the same direction at the same angle.

For of the rear pair 20 of wheels 16, the gears 26 engage with central gear 28 by means of intermediate gears 32, also rotatably mounted in, on or above body 12 by means of axle 34. Therefore, rotation of central gear 28 will cause the intermediate gears 32 to rotate and this will cause the gears 26 of the rear pair 20 of wheels 16 to rotate in the opposite direction to the gears 26 of the front pair 18 of wheels 16.

Therefore, upon central gear 28 rotating, the gears 26 of the rear pair 20 of wheels 16 will rotate in the opposite direction to the gears 20 of the front pair 18 of wheels 16. In that way, the rear pair 20 of wheels 16 will move together in the direction opposite to the front pair 18 of wheels 16. Therefore, if front pair 18 of wheels 16 turn to the left, the rear pair 20 of wheels 16 will turn to the right.

It is preferred that gears 26 be identical such that the extent of angular rotation of both the front pair 18 of wheels 16 and rear pair 20 of wheels 16 will be the same. Gears 32 can be different to the gears 26, but should be the same as each other.

In this way, upon a force being applied to the handle to the left, the front pair 18 of wheels 16 will turn to the left, and the rear pair 20 of wheels 16 will move to the right. This allows the body 12 to easily turn - quite often about its central (vertical) axis.

The gears 26 are preferably a 360° gear although they may be a segment of a circle, if desired. The central gear 28 may also be a full 360° gear, although again it may be a plurality of segments - there being a segment for each wheel 16, or each pair of wheels 18, 20.

This therefore provides four wheel steering. It is also to be noted that it also allows for traditional castor movement in that the wheels 16 are capable of rotation through 360°. However, as they are inherently linked by virtue of the gear system, it is impossible to have any of the wheels 16 clashing. Therefore, it is possible to have wheels 16 of larger diameter. Furthermore, as the wheels 16 are always correctly aligned, the centre of gravity will always be between the wheels 16 and with a sufficient distance between the centre of gravity and each of the wheels 16 that there will be some stability, even for a relatively small body 12. Furthermore, by virtue of the alignment of the wheels 16, it will be quite difficult to move the body 12 in a direction transverse to the wheels 16. Therefore, if the wheel 16 were aligned in a front-rear direction (as illustrated) it will be quite difficult to move the body 12 sideways. This is quite different to a normal castor where a lateral force will turn the castors at least at one end to move the article to which the castors are fitted.

To refer now to the embodiment of Figures 2 and 3, this operates in a similar way to the embodiment of Figure 1. For the embodiment of Figures 2 and 3, like components receive like referenced numerals, but with the addition of a prefix number 1.

To view the drawings, there is shown a vehicle 110 with a body 112. A handle 114 is provided to enable the vehicle 110 to be moved and steered. The body 112 has four wheels 116, all substantially identical, although this is not of necessity always so. The wheels 116 are arranged as a front pair 118 of wheels 116, and a rear pair 120 of wheels 116. Each wheel is mounted to the body 112 of vehicle 110 by means of a substantially horizontal axle 122, each axle 122 being separate. Each wheel 116 is attached to its axle 122 by a link 124 so that the wheels 116 will act as a castor. Each axle 122 is securely mounted to a gear 126, the gear 126 preferably being mounted within body 112 by a pin 123, although it may be above or below body 112. Again, each gear 126 does not directly engage any other gear 126. Each gear 126 may be a 360° gear, or may

be only a segment of a gear. Each gear 126 is mounted within body 112 by a pin 123.

Also mounted within body 112 by an axle 130 is a central gear 128. Again, central gear 128 may be located within, above or below body 112. Central gear 128 directly engages both of the gears 126 of the front pair 118 of wheels 116. Therefore, movement of one wheel 116 of one of the front pair 118 of wheels 116 will cause axle 122 to rotate thus rotating the relevant gear 126. That will cause central gear 128 to rotate. Therefore, the other gear 126 of the other wheel 116 of the front pair 118 will also rotate. By virtue of the arrangement, the rotation of the two front gears 126 will be in the same rotational direction and thus each wheel 116 of the front pair 118 of wheels 116 will point in the same direction. If the two front gears 126 are substantially identical, wheels 116 of the front pair 118 will both point in the same direction at the same angle.

For the rear pair 120 of wheels 116, the gears 126 engage with central gear 128 by means of intermediate gears 132, also rotatably mounted in, on or above body 112 by means of axle 124. Therefore, rotation of central gear 128 will cause intermediate gears 132 to rotate and this will cause the gears 126 of the rear pair 120 of wheels 116 to rotate in the opposite direction to the gears 126 of the front pair 118 of wheels 116. Therefore, upon central gear 128 rotating, the gears 126 at the rear pair 120 of wheels 116 will rotate in the opposite direction to the gears 126 of the front pair 118 of wheels 116. In that way, the rear pair 120 of wheels 116 will move together in the direction opposite to the front pair 118 of wheels 116. Therefore, if front pair 118 of wheels 116 turn to the left, the rear pair 120 of wheels 116 will turn to the right.

It is preferred that gears 126 be identical such that the extent of angular rotation of both the front pair 118 of wheels 116 and the rear pair 120 of wheels 116 will be the same. However, it may be preferred for the gears 126 with the rear pair 120 of wheels 116 to be different to the gears 126 of the front pair 118 of wheels

116. In this way, upon a force being applied to the handle 114 in the direction indicated by the arrow on Figure 2, the front pair 118 of wheels 116 will turn to the left, as is shown by the arrows adjacent each wheel 16. The rear pair 120 of wheels 116 will move in the direction of their arrows with a different ratio, to the right.

With this embodiment, wheels 116 may be more of the conventional wheel and therefore may be of somewhat larger diameter. This means that the angular movement will be restricted as wheels 116 will tend to contact body 120 at larger degrees of angular movement of wheels 116 as they are located beside body 112. For that reason, gears 126, 132 and 128 may be segments of a gear. In this instance, gear 128 would have either two or four segments. This would be sufficient to enable the maximum amount of movement of wheels 116 relative to body 112.

It is preferred that a centralising device 136 is provided. This may be in accordance with our earlier patent application number PP0590, the contents of which are hereby incorporated by reference. Alternatively, it may be a substantially "H" device 137, with a projection 139 on central gear 128 locating within the H. Rotation of central gear 128 causes projection to contact the H device 137 thus causing it to move about its mounting. A spring 141 is provided to bias the H device 137, and thus projection 139 and therefore central gear 128, to the central position shown.

The embodiment of Figure 4 operates in very much the same way as the embodiment of Figures 1. For the embodiment of Figure 4, like components receive like reference numerals, but with the addition of a prefix number 2.

The vehicle generally designated 210 has a body 212. There are four wheels 216 arranged as a front pair 218 and a rear pair 220, as in the embodiment for Figure 1.

In this instance the body 212 is generally the same as for a supermarket trolley and thus is intended to be able to stack. The wheels 216 are therefore castor wheels, although as is clear from the previous description any form of wheel may be used. Again, each of the wheels 216 is mounted on an axle 222 to which is mounted a gear 226. It is preferred that the gears 226 be identical so that the degree of angular change will be constant.

Operatively connecting the gears 226 is a continuous chain or drive belt 238. If a drive belt 238, it would be a toothed belt on both sides. Preferably, at least one, although two are illustrated, idler sprockets 240 are used so as to maintain continuity of the chain or belt 238. The idler sprockets 240 would be rotatably mounted within body 212. Advantageously, a spring tensioning device 242 would be provided between the sprockets 240 so as to maintain the chain or belt 238 under constant tension. As chains or belts such as that of 238 have a tendency to stretch, or vary in length according to temperature, the spring tensioning device 242 will maintain constancy of contact between the chain or belt 238 with gears 226.

As with the embodiment of Figure 1, movement of one of the wheels 216 to change its direction relative to the body 212 will cause its gear 226 to also rotate with the axle 222. This will therefore cause movement of the belt or chain 238. This will therefore drive all other gears 226 such that all wheels 216 change direction. Therefore, for example, if the front wheels 218 move to the right, the rear wheels 220 will move to the left.

This form of arrangement will be most suitable for supermarket trolleys or the like as the arrangement is such that it could fit in within the normal frame of a supermarket trolley, without interfering with its stackability, nor its ability to be able to be stacked with others and moved in a "convoy". This is due to the substantially open area 244 within the frame 212, as is common with supermarket trolleys.

Although four wheels are shown in each of the embodiments, naturally the number of wheels concerned may be two or any number greater than two.

As an alternative to gears, rollers may be used with there being frictional engagement under an applied force, such as by a spring.

Furthermore, there may be a combination of a belt/chain drive, and gears. This may be particularly relevant for the rear pairs 20, 120 of the embodiment of Figure 1, as well as that of Figures 2 and 3. As an alternative, by virtue of the idler sprockets 240 in the embodiment of Figure 4, the gears 216 of the rear pair 220 may operatively engage the idler sprockets 240 rather than be driven by the chain or belt 238.

The embodiment of Figure 5 is similar to the earlier embodiments and therefore like components use like reference numerals but with the addition of a prefix number 3.

The embodiment of Figure 5 is similar to that of Figures 2 and 3.

To view the drawing, there is shown a vehicle 310 with a body 312. A handle 314 is provided to enable the vehicle 310 to be moved and steered. The body 312 has four wheels 316, all substantially identical, although this is not of necessity always so. The wheels 316 are arranged as a front pair 318 of wheels 316, and a rear pair 320 of wheels 316. Each wheel 316 is mounted to the body 312 of vehicle 310 by means of a substantially horizontal axle 322, each axle 322 being separate. Each wheel 316 is directly attached to its axle 322 with each axle 322 having an integral pivot member 325 pivotally attached to body 312 by pivot 327. Gear 326 of the rear pair 320 of wheels 316 directly engages a gear 326 of the front pair 318 of wheels 316. Each gear 326 may be a 360° gear, or may be only a segment of a gear, as shown.

The arrangement for the front pair 318 of wheels 316 is the mirror image of that for the rear pair 320 of wheels 316. Therefore, if a front wheel turns to the right, the corresponding rear wheel will turn to the left.

So that all wheels 316 will be correctly oriented, pivot member 325 for the front pair 318 of wheels 316 has a front portion 331 which has at its end a further gear segment 333 engaging an idler gear 335.

Therefore, if a force is applied to handle 314 to turn vehicle 310 to the right, the top front wheel 316 will turn to the right. This causes pivot member 325 to pivot about pivot 327 so that gears 326 will move, and further gear 333 will cause idler gear 335 to have the further gear 333 move so that the front pair 318 of wheels 316 turn to the right, and the rear pair 320 of wheels 316 turn to the left. By virtue of idler gear 335, the left and right sides of the vehicle 310 will work synchronously.

The embodiments of Figure 6 is essentially the same as for Figure 5, except that full gears 426 are used, and pivot members 425 are shortened and are the same at the front and rear. This enables the wheels 416 to turn through 360°, if required. Wheels 416 can be mounted below body 412, as shown.

Similarly, Figure 7 is effectively a combination of the features of Figures 5 and 6 with gears 526, and pivot members 525. In essence, its operation is the same as that of Figure 5. However, if full 360°, wheels 516 can rotate through 360°, if desired.

As has been mentioned, for certain embodiments (e.g. when the angular movement of the wheels is limited) the rear pair may have a ratio different to that of the front pair so that the degree of change of angle of the rear pair of wheels will be different to that of the front pair of wheels.

Whilst there has been described in the foregoing description preferred constructions of vehicles incorporating the principal features of the present invention, it will be understood by those schooled in the technology concern that many variations in details of design or construction may be made without departing from the present invention.

It will be understood that the invention disclosed and defined herein extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations constitute various alternative aspects of the invention.

It will also be understood that where the term "comprises" or its grammatical variants, is employed herein, it is equivalent to the term "includes" and is not to be taken as excluding the presence of other elements or features.

CLAIMS

1 A vehicle (as hereinbefore defined) having a plurality of spaced-apart wheels (as hereinbefore defined), each wheel being attached to the vehicle by means of an axle, there being a separate axle for each wheel, each axle having a longitudinal axis; the arrangement being such that rotation of one axle about its longitudinal axis will cause the wheel mounted thereon to change direction relative to the vehicle, each axle having attached thereto a driven means, each driven means being adapted to be driven by a drive means such that rotation of one axle causes all other axles to also rotate about their longitudinal axis.

2 A vehicle according to claim 2, further including a spring tensioning means so as to maintain appropriate contact between the drive means and each of the driven means.

3 A vehicle according to claim 1 or claim 2, further including a centralising device.

4 A vehicle according to any one of claims 1 to 3, wherein the driven means is a driven gear.

5 A vehicle according to any one of claims 1 to 4, wherein the drive means is a drive gear system.

6 A vehicle according to claim 5, wherein the drive gear system includes a central gear which is in engagement with two of the driven gears, and which engages the others of the driven gears by means of intermediate gears.

7 A vehicle according to claim 6, wherein the two driven gears in direct

contact with the central gear are at the one end of the vehicle.

8 A vehicle according to claim 6 or 7, wherein the wheels are arranged as a front pair of wheels and a rear pair of wheels, the front pair of having their driven gears being driven by direct engagement with the central gear.

9 A vehicle according to any one of claims 1 to 4, wherein the drive means is a chain or belt drive.

10 A vehicle according to claim 10, wherein the wheels are arranged as a front pair of wheels and a rear pair of wheels.

11 A vehicle according to any one of claims 10, wherein the front pair of wheels are adapted to be driven by the chain or belt drive so the rotation of one of the front pair of wheels will cause the other of the front pair of wheels to turn in the same direction, each of the rear pair of the wheels turning in the opposite direction.

12 A vehicle according to any one of claims 6 to 8, wherein each driven gear is a gear segment,

13 A vehicle according to any one of claims 1 to 12, wherein each axle is substantially vertical.

14 A vehicle according to any one of claims 1 to 3, wherein each axle is substantially horizontal.

15 A vehicle according to claim 14, wherein the driven means is a driven gear segment.

16 A vehicle according to claim 15, wherein the driven gear segment is attached to its axle by a pivot member, the driven gear segment being at a

first end of the pivot member.

17 A vehicle according to claim 16, wherein each pivot member is pivotally, attached to the vehicle intermediate its length.

18 A vehicle according to any one of claims 15 to 17, wherein the wheels are arranged as a front pair of wheels and a rear pair of wheels.

19 A vehicle according to claim 18, wherein the driven gear segments of the front pair of wheels are operatively connected by an idler gear.

20 A vehicle according to claim 19, wherein the pivot member for each of the front pair of wheels has a front portion, to which the driven gear segments are attached.

21 A vehicle according to any one of claims 18 to 20, wherein each pivot member for the front pair of wheels has a rearwardly extending portion, each rearwardly extending portion having a rear end to which is attached a further driven gear segment.

22 A vehicle according to claim 21, wherein each further driven gear segment is operatively connected to the respective driven gear segment of the rear pair of wheels.

23 A vehicle according to claim 19, wherein the idler gear has two diametrically opposed gear segments.

24 A vehicle (as hereinbefore defined) substantially as hereinbefore described with reference to the accompanying drawings.

Figure 1

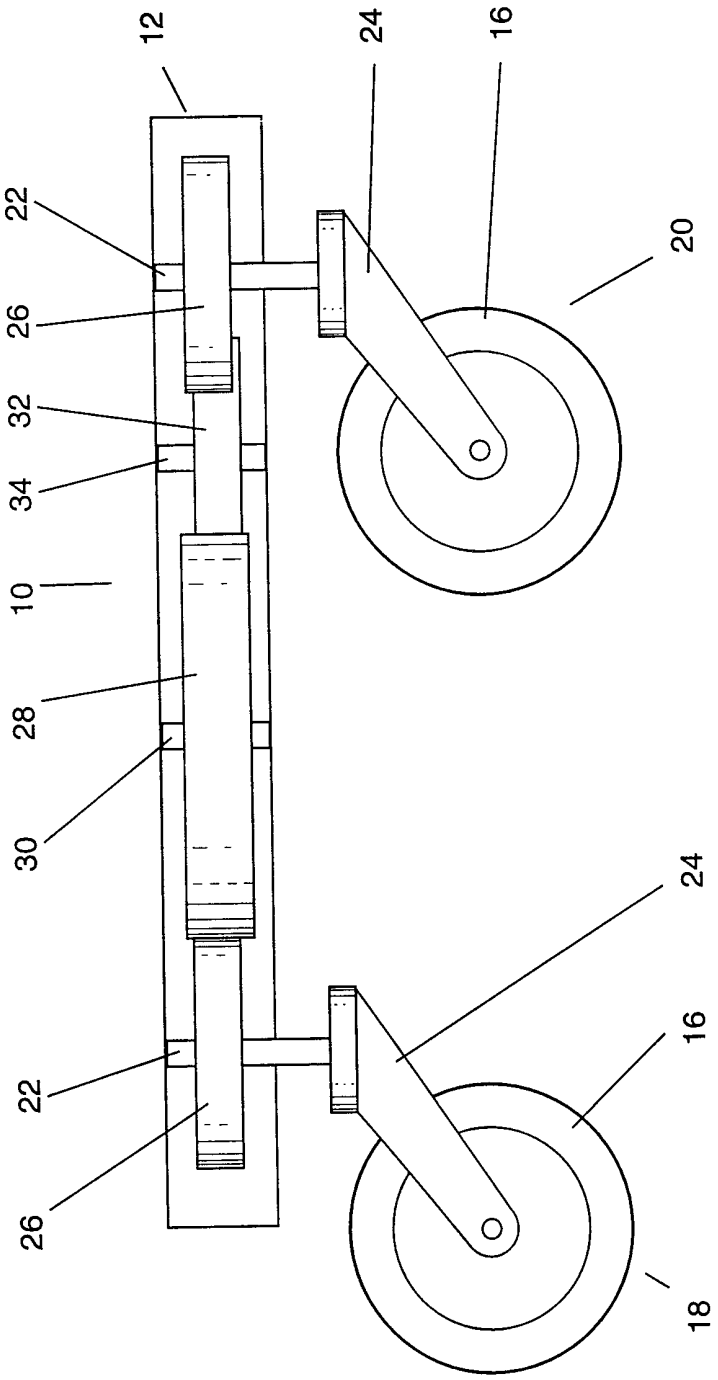


Figure 2

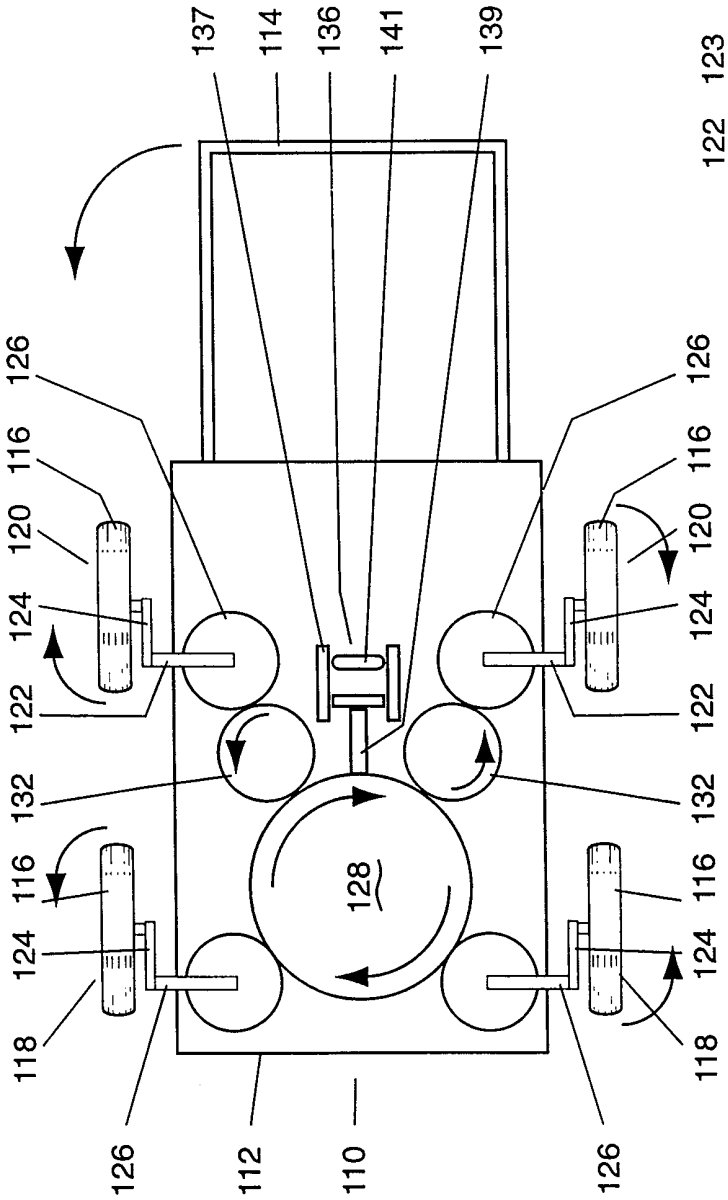


Figure 3

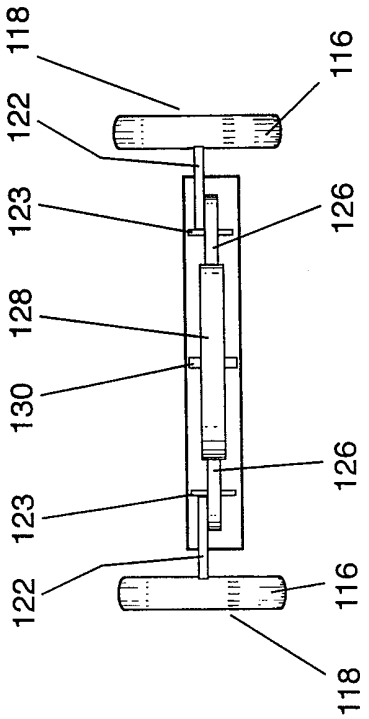


Figure 4

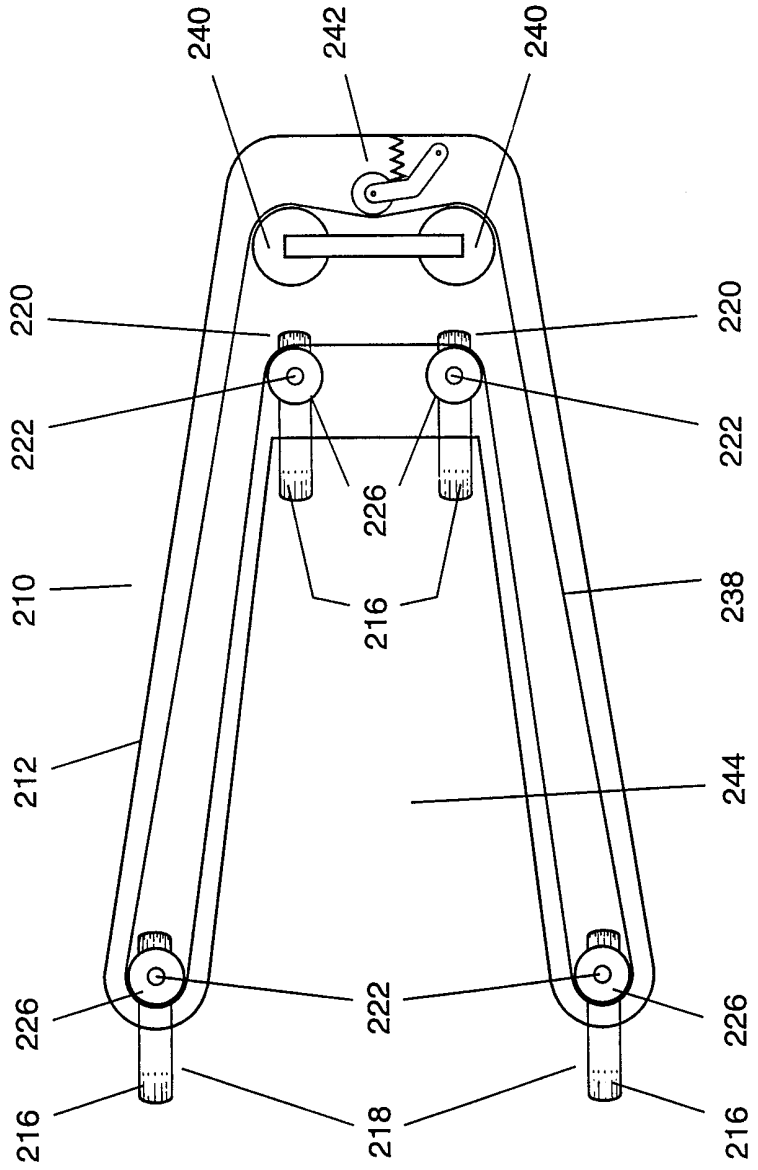

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Figure 5

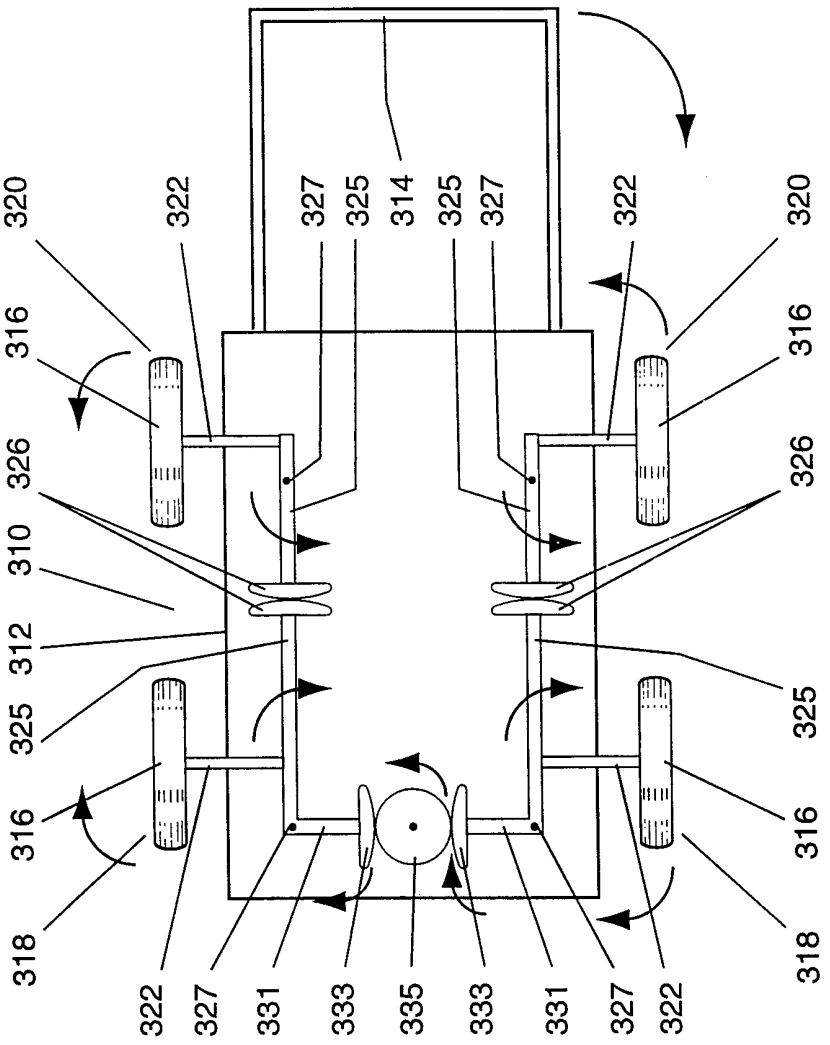

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Figure 6

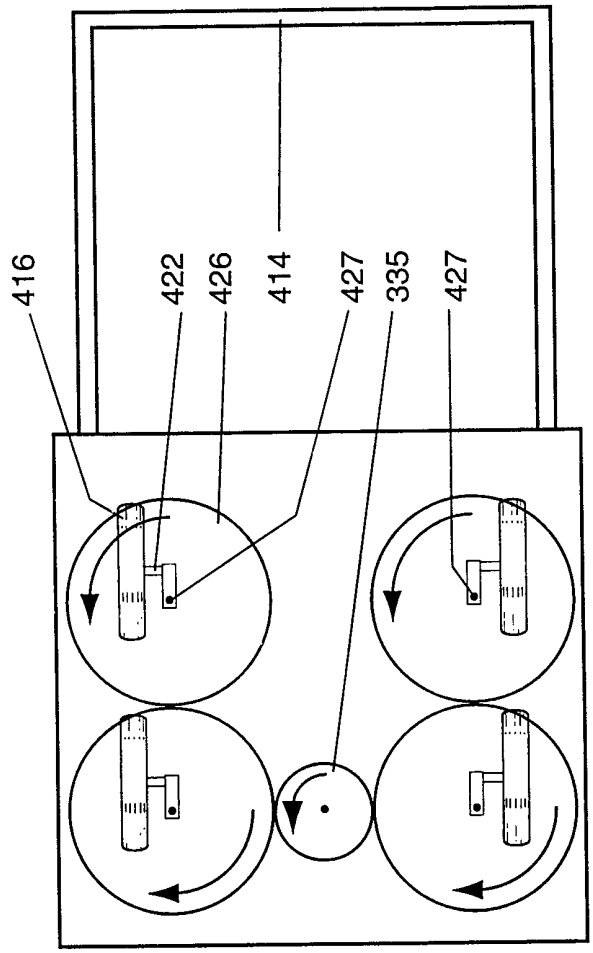
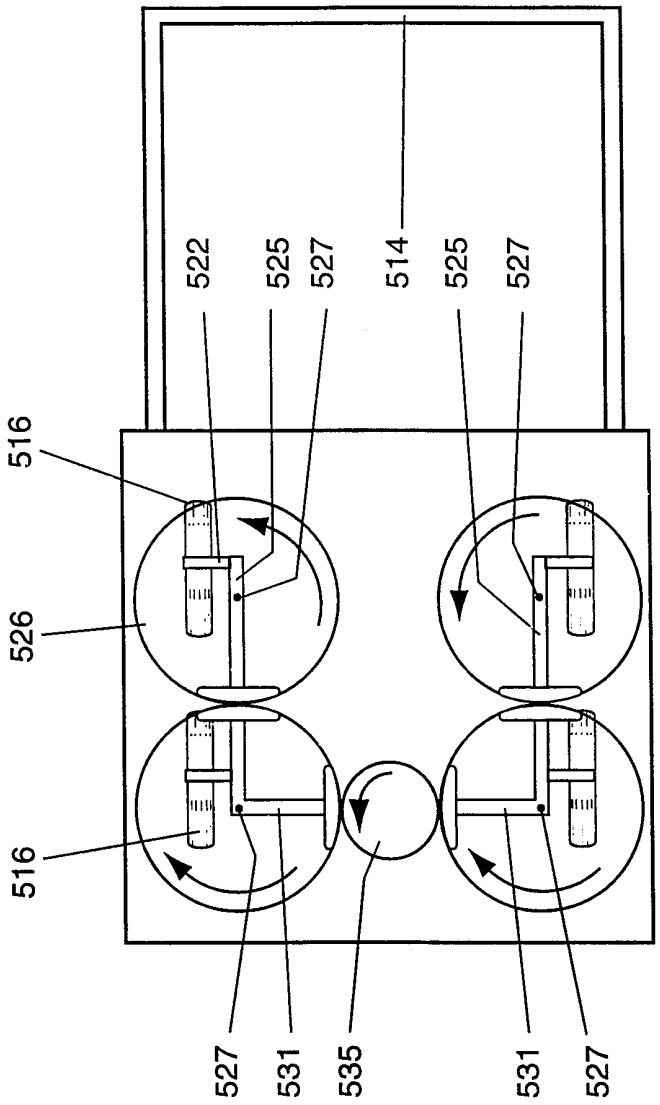


Figure 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 99/00106

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: B62B 3/00, 7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC : B62B 3/00, 7/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	Derwent Abstract Accession No. A1269C/01, class Q22, SU 656900 A (KLAVDIEV M S) 16 April 1979 abstract	1, 4, 5, 10, 13 9, 11, 12
X Y	DE 3039947 A (DITTMER H F WERKZEU) 3 June 1982 whole document	1, 4, 5, 10, 13 11

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 March 1999	25 MAR 1999

Name and mailing address of the ISA/AU	Authorized officer
AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (02) 6285 3929	**B. NGUYEN** Telephone No.: (02) 6283 2306

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 19514092 A (MOVIETECHIN FILMGERAETE GMBH) 17 October 1996 whole document	1, 9-11, 13 4, 5
X	DE 3514638 A (ARGUS FILM GMBH) 30 October 1986 whole document	1,2,4,5,9-11,13
X Y	AU 51516/96 A (ALAISTER) 26 September 1996 whole document	1,4,5,10,11,13 9
X Y	US 5322140 A (BUSSINGER) 21 June 1994 whole document column 5 line 54 to column 6 line 20 and fig.7	1, 4, 5, 10, 13 6 - 9, 11, 12

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU 99/00106

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
AU	51516/96	WO	96/29228	EP	812279	CA	2215841

END OF ANNEX