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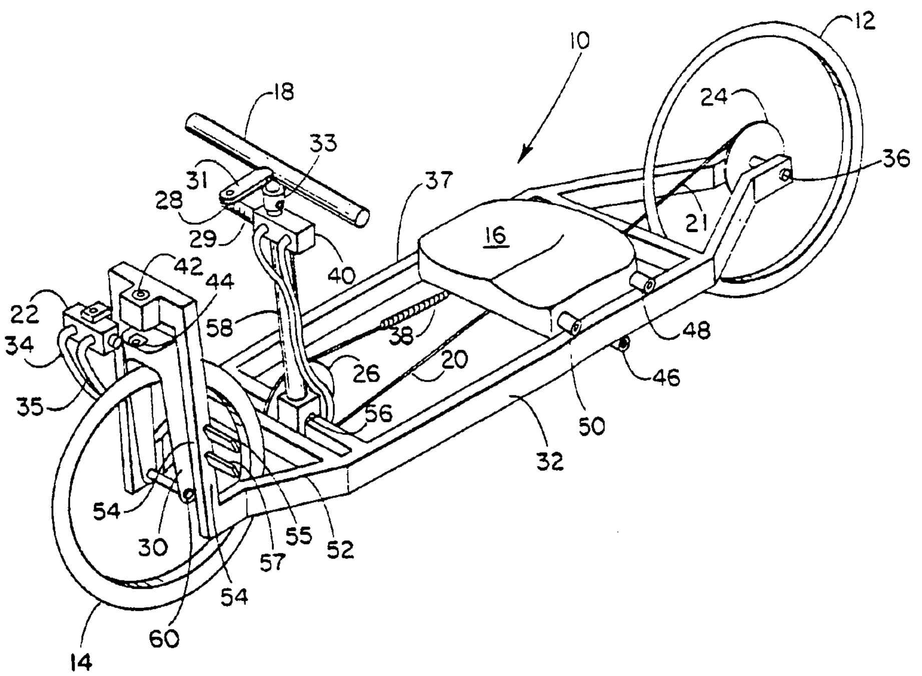

(57) Abstract

A row bicycle (10) using hydraulic or mechanical steering (40, 22) through which an actuator (18) propels the row bicycle. The bicycle has a sliding seat (16) attached to a frame (32). A rear wheel (12) is attached to the frame. An oscillating mechanism (58), also attached to the frame is powered by the occupant's arms. A hydraulic control mechanism (40) is attached to the oscillating mechanism to steer the front wheel (14). An alternate embodiment of the invention provides a mechanical rack (104) and pinion steering mechanism. In yet another embodiment of the invention an oscillating plunger (202) is used to provide motive power and is used to steer the front wheel.

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ROW BICYCLE APPARATUS

This invention relates to a bicycle and more particularly to a bicycle that can be propelled using a rowing motion.

BACKGROUND OF THE INVENTION

Bicycles, and more particularly two wheeled human powered vehicles have been the subject of numerous invention and improvement. The conventional bicycle uses the power of the legs to propel the rider and bicycle. Other two wheeled human powered vehicles use the power of the arms, legs and torso to propel the rider and vehicle. More particularly, United States Patent Number 4,928,986 to Paul R. Carpenter of Lakewood, Colorado provides an arm and leg powered cycle where the powered cycle uses a linear reciprocating motion of the arm and leg to drive members to provide power. The arm and leg powered cycle incorporates two wheels, a seat and a backrest. The arm drive member includes a rotatably mounted housing in which the plunger linearly reciprocates when an operator "rows" the plunger using handle bars. Pulling on the arm plunger tightens the cable attached to one end of the plunger and the other end to a chain engaging a sprocket. The sprocket is constrained to rotate in one direction by a one way dog. The chain engaging sprocket engages a chain drive on the pulling or drive stroke thereby pulling a chain through the stroke. The motion is transferred to drive the rear wheel through a series of gears in a transmission. Pushing on the leg drive member creates a drive stroke of the same type which provides power to the drive chain also. The arms and legs may be used either jointly or independently to power the vehicle. Steering is accomplished by shaping the arm plunger and the associated housing sheets so as to allow linear reciprocation but not rotation relative to one another. Thus, tilting of the handle bars rotates the drive housing through a series of gears turning a steering fork on which the front wheel is mounted.

United States Patent Number 4,541,647 to Norman L. Braun of Manitoba, Canada describes a recumbent bicycle that uses a four bar linkage to power the rear wheel through the front pedal sprocket, the four bar linkage being attached at one end to a linkage and at the other end to an elongated bar that is operated by the hands while in the recumbent position.

United States Patent 4,632,414 to Mark W. Elfson of Chaska, Minnesota entitled "Land Vehicle Propelled By Simulator Rowing Motion" provides a land vehicle propelled by rowing or sculling motion of a rowing member incorporating a moving seat which also incorporates front wheels which are journaled from each side of the frame. The vehicle provides three wheels, including two front steering wheels.

Prior art two wheeled arm and leg powered vehicles have provided less than adequate vehicle characteristics. Two wheeled vehicles that incorporate human power through the arms and the legs have been unable to incorporate a sliding seat to duplicate the rowing motion used in water craft and rowing simulators. Prior art bicycles have used steering and drive mechanisms that are primarily mechanical in nature and with numerous wear and bearing surfaces that reduce the efficiency and usefulness of the vehicle.

Prior art row bicycles that incorporate more of the natural rowing motion have been forced to resort to the use of three wheels to correct the inherent steering instabilities of the two wheeled row bicycle. Three wheels are provided to counteract the wide ranges of forces introduced on the bicycle during the act of rowing. These forces include the force of the occupant sliding back and forth on the rowing seat and the forces generated while moving power and control arms.

It is therefore a motive of the invention to provide a two wheeled row bicycle apparatus that is easy to steer, that provides good power transfer to the wheels, and allows the easy balancing of the bicycle as it progresses down the road while truly rowing.

SUMMARY OF THE INVENTION

The invention provides a row bicycle apparatus using hydraulic steering through which an actuator propels the row bicycle. The bicycle has a sliding seat attached to a frame. A rear wheel is attached to the frame. An oscillating mechanism, also attached to the frame is powered by the occupant's arms. A hydraulic control mechanism attached to the oscillating mechanism steers the front wheel. An alternate embodiment of the invention provides a mechanical rack and pinion steering mechanism. In yet another embodiment of the invention an oscillating plunger is used to provide motive power and is used to steer the front wheel.

It is an object of the invention to provide a row bicycle with hydraulic steering.

It is yet another object of the invention to provide an improved row bicycle that provides for a sliding seat mount to better approximate a true rowing motion.

It is yet another object of the invention to provide a two wheeled land vehicle that allows the cardiovascular workout associated with rowing in an outdoor setting.

It is yet a further object of the invention to provide a two wheeled vehicle which provides the cardiovascular workout of rowing on roads and road surfaces, out of water.

It is yet another object of the invention to provide a two wheeled human powered row bicycle with superior handling to a three wheeled human powered row bicycle, especially around corners.

Other objects, features and advantages of the present invention will become apparent to those skilled in the art through the description of the preferred embodiment, claims and drawings herein where like numerals refer to like elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a schematic of the row bicycle of the invention.

Figure 2 shows a side view of the row bicycle of the invention.

Figure 3 shows a schematic view of the front of the row bicycle of the invention.

Figure 4 shows a schematic of the hydraulic steering control mechanism of the row bicycle of the invention.

Figure 5 shows a schematic view of the seat mounting mechanism of the invention.

Figure 6 shows a schematic view of an alternate embodiment of the power and steering mechanism of the row bicycle of the invention.

Figure 7 shows a side view of an alternate embodiment of the row bicycle of the invention.

Figure 8 shows a schematic view of an alternate embodiment of the steering mechanism of the row bicycle of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Now refer to Figure 1 which shows a schematic of the row bicycle of the invention. Row bicycle 10 is comprised of two wheels 12 and 14. The two wheels 12 and 14 provide the contact and balancing points for the row bicycle 10. Row bicycle 10 has an integrated seat 16 which slides on frame 32. Seat 16 slides on frame 32 on rollers 46, 48, and 50. Row bicycle 10 is steered via a hydraulic steering mechanism. The hydraulic steering mechanism is comprised of hydraulic cylinder 40 with hydraulic lines 35 and 34 providing control power to hydraulic cylinder 22. Hydraulic cylinder 40 has a hydraulic piston 29 which is connected to steering bar 18 through linkage member 31. Hydraulic cylinder 40 is connected to a vertical support member 58 by support 33. Hydraulic cylinder 22 transfers the control power from hydraulic cylinder 40 through piston 44. Piston 44 is linked to steering fork 30.

The output of hydraulic cylinder 40 provides hydraulic control power to hydraulic cylinder 22. Piston 44 causes steering fork 30 to rotate in response to hydraulic piston 44. Steering fork 30 rotates about the axis of its neck 42. The neck 42 of steering fork 30 is attached to, and rotates within, vertical frame member 54. Vertical frame member 54 is connected to steering frame 52. Steering frame 52 is connected to main frame 32. Steering fork 30 is connected to the axis 60 of wheel 14. The rotation of steering fork 30 accomplishes the steering of row bicycle 10 through turning wheel 14.

Motive power is supplied to the row bicycle apparatus 10 through a rowing motion. The rowing mechanism comprises the steering bar 18 and vertical support member 58. The rowing motion causes vertical support member 58 to rotate about its pivot point 56. Sprocket 26 is affixed to the pivot point of vertical support member 58 causing it to rotate about its axis with the motion of vertical support member 58. Sprocket 26 engages chain 20.

Spring 38 maintains tension on chain 20 and stretches to allow for the rowing motion. Spring 38 then retracts chain 20 when the rowing motion has been completed and the rowing mechanism is returned to the starting point. Sprocket 24 engages wheel 12 with a one way dog. Wheel 12 then rotates around its axis 36. Axis 36 provides the connection between wheel 12 and frame 32. Seat 16 facilitates the rowing motion by sliding along rollers 46, 48, and 50 on frame 32. By sliding back during the rowing motion, a longer stroke is allowed.

Now referring to Figure 2, Figure 2 shows a side view of one alternative embodiment of the row bicycle of the invention. The row bicycle has two wheels 12 and 14 which provide contact and balancing points. The row bicycle has a hydraulic steering mechanism. The hydraulic steering mechanism is comprised of a hydraulic cylinder 40 attached to vertical support member 58 by support 33. A hydraulic differential signal is input to hydraulic cylinder 40 by the rotation of steering bar 18. Linkage member 31 conveys the rotational motion of steering bar 18 to hydraulic cylinder 40.

Hydraulic lines 34 and 35 convey the hydraulic differential signal to hydraulic cylinder 22. Hydraulic cylinder 22 has a piston 44 attached to steering fork 30. Piston 44 moves in response to hydraulic signal received by hydraulic cylinder 22. Piston 44 is connected to steering fork 30. Linear movement of piston 44 causes steering fork 30 to rotate. Steering fork 30 is attached to wheel 14 through its axis. Wheel 14 rotates in conjunction with steering fork 30, thus achieving the steering of the row bicycle of the invention.

The row bicycle further includes a rowing mechanism. Steering bar 18 and vertical support member 58 may be pulled through a rowing motion to rotate around a pivot point 56. Sprocket 26 is also attached to vertical support member 58 causing sprocket 26 to rotate with the motion of vertical support member 58. The rotation of sprocket 26 engages chain 20. Chain 20 in turn engages chain drive 25. Chain drive 25 then engages chain 21 through an advantageous gear ratio. Chain 21 engages sprocket 24, thus turning the attached wheel 12. The row bicycle provides for an improved range of motion through the use of seat 16 thus allowing the legs of the occupant to fully participate in providing power to move the row bicycle forward. Seat 16 slides along rollers 46, 48, and 50 along frame 32.

Those skilled in the art will recognize that the inclusion of a one way dog 23 is essential to allow the return of drive chain 20 for the next stroke. One way dog 27 is provided to allow chain 21 to coast while wheel 12 freewheels. However, one way dog 27 may be eliminated.

Now referring to Figure 3 which shows a schematic view of the front of the row bicycle of the invention. This view illustrates the hydraulic steering mechanism of the row bicycle of the invention. Hydraulic cylinder 22 transfers control power through piston 44. Hydraulic cylinder 22 is mounted on vertical frame member 54. Piston 44 attaches to steering fork 30 by linkage 64. The linear motion of piston 44 and resulting motion of linkage 64 causes steering fork 30 to rotate along the axis of its neck 42. Steering fork 30 is constrained through the passage of its neck through bearing 43 to rotational motion relative to vertical frame member 54. Bearing 43 constrains the movement of neck 42 to rotation along its axis because of its attachment to vertical frame member 54. The attachment of bearing 43 to vertical frame member 54 also provides support to steering fork 30. Vertical frame member 54 connects on its lower end to steering frame 52. Steering fork 30 is attached to axle 60 which acts as the axis of rotation for wheel 14. Axle 60 connects to wheel 14 through its hub 62. Thus the rotation of steering fork 30 causes the similar rotation of wheel 14, accomplishing the steering of the row bicycle of the invention.

Foot pedals 55 and 57 are located on both sides of vertical frame member 54. Foot pedals 55 and 57 allow for a stable platform for the operator of the row bicycle to perform the rowing motion. The feet of the operator are placed between the foot pedals to allow the rider to pull himself forward.

Now referring to Figure 4, Figure 4 shows a schematic view of the hydraulic steering control mechanism of the apparatus of the invention. The hydraulic steering control mechanism of the row bicycle of the invention comprises a steering bar 18 and a vertical support member 58. Steering bar 18 is mounted on vertical support member 58 and may be rotated on axis 59. Piston 29 is anchored on steering bar 18 at a point some predetermined distance from axis 59. Rotation of steering bar 18 on axis 59 provides movement of piston 29. The movement of piston 29 within hydraulic cylinder 40 provides for a differential signal. This signal is output from hydraulic cylinder 40 through hydraulic lines 34 and 35. Support 33 positions hydraulic cylinder 40 relative to steering bar 18 by providing a connection to vertical support member 58.

Now referring to Figure 5, Figure 5 shows a schematic view of an example of a seat mounting mechanism of the invention. Seat 16 is supported by horizontal support elements 339 and 337. Horizontal support elements 339 and 337 form a portion of the frame of the row bicycle of the invention. Seat 16 may slide along horizontal support elements 339 and 337 via a series of rollers. Rollers 46, 48, 50, 66, 68, and 70 provide support for the vertical stability of seat 16 along the horizontal support members 339 and 337. Rollers 46, 48, and 50 rotate around a set of axes 80. Rollers 66, 68, and 70 likewise rotate around a set of axes 82. Rollers 48 and 50 are mounted on seat 16 so as to roll along the top of horizontal support member 339. Roller 46 is mounted on seat 16 so as to roll along the underside of horizontal support member 339. In the same fashion, rollers 66 and 70 are mounted on seat 16 so as to roll along the top of horizontal support member 337, and roller 68 is mounted on seat 16 so as to roll along the underside of horizontal support member 337. In this manner seat 16 is constrained from moving in the vertical plane.

Seat 16 is constrained to move in a linear fashion in the horizontal plane by rollers 72, 74, 76, and 78. Rollers 72 and 74 are mounted on seat 16 so as to roll along the inside plane of frame 39 facing frame 337. To provide stability and to maintain the linear movement of seat 16, rollers 72 and 74 are mounted some predetermined distance apart. Likewise, rollers 76 and 78 are mounted on seat 16 so as to roll along the inside plane of frame 337 some predetermined distance apart. In this fashion seat 16 is provided with a stable linear range of motion relative to the frame of the row bicycle of the invention.

Referring to Figure 6, Figure 6 shows a schematic view of an alternate embodiment of the power and steering mechanism of the row bicycle of the invention. The row bicycle is powered through a rowing mechanism. The rowing mechanism comprises cylinder 118 which is attached at its lower end to housing 148. Housing 148 contains and protects a portion of the steering mechanism of the row bicycle of the invention. Housing 148 also rotates with the motion of cylinder 118. Housing 148 extends to supports 132 and 134. Supports 132 and 134 rotate with housing 148 and rest within bearings 106 and 108. Bearings 106 and 108 attach to frame 32 to provide stability and a platform. Bearings 106 and 108 allow the motion of the described rowing assembly relative to the frame of the row bicycle of the invention. Support 134 to the left of housing 148 as depicted in Figure 6 connects to drive plate 101. Drive plate 101 is connected to drive sprocket 102. Drive sprocket 102 drives chain 20.

The row bicycle of the invention may include a rack and pinion type steering mechanism. The steering mechanism comprises a steering shaft 120 housed within cylinder 118. Bearings 136 and 138 rest within cylinder 118 encircling steering shaft 120. This configuration allows for the rotation of the steering shaft 120 independent of the movement of the cylinder 118. Gear 140 is affixed to the steering shaft 120 between bearings 136 and 138 to provide for maximum stability of the system. Rotation of steering shaft 120 results in the similar rotation of gear 140. Gear 140 is placed in contact with round rack 104. Round rack 104 has circular threads 112 to achieve the first step of the rack and pinion steering method. The rotation of gear 140 causes the movement of rack 104 in a linear fashion along the axis of rack 104. The direction of the movement of rack 104 is dependent on the direction of rotation of gear 140. Bearings 144 and 146 are affixed to housing 148 and thus stabilize the linear movement of rack 104. Rack 104 passes through housing 148 and contacts gear 116 near its right end as depicted in Figure 6. Gear 116 has a steering shaft 110. Steering shaft 110 passes through gear 116 and has at its upper end bevel gear 126. Bearing 114 is affixed to frame 32. Steering shaft 110 passes through bearing 114 on its lower end just above attached gear 116. Bearing 114 constrains movement steering shaft 110 relative to frame 32. The linear movement of rack 104 relative to frame 32 therefore causes the rotation of gear 116 and attached shaft 110.

The rotation of shaft 110 causes the corresponding rotation of bevel gear 126. Bevel gear 126 contacts bevel gear 128. Rotation of bevel gear 126 causes bevel gear 128 to rotate in the opposite direction. Neck 130 of steering fork 122 forms the axis of bevel gear 128 and rotates with the rotation of bevel gear 128. Neck 130 passes through bearing 124 which is affixed to a stable point of reference not shown. Bearing 124 constrains motion relative to the frame of the row bicycle other than rotational motion. Neck 130 then connects to steering fork 122. Steering fork 122 rotates with its neck 130 supporting wheel 14 not shown.

Now referring to Figure 7, Figure 7 shows a side view of another example of a row bicycle 200. Row bicycle 200 is comprised of two wheels 228 and 226. The two wheels 228 and 226 provide the contact and balancing points for the row bicycle 200. Wheel 226 rotates around its axis 244. Axis 244 serves as a linkage between wheel 226 and steering fork 236. Steering fork 236 connects to frame 220 through its neck 246. Row bicycle 200 has an integrated seat 222. Seat 222 facilitates the rowing motion that powers row bicycle 200 by sliding along frame 220 on rollers 266, 268 and 269. Row bicycle 200 is powered via a rowing type mechanism. The rowing mechanism is comprised of steering bar 208 and slide bar 202 providing motive power. Steering bar 208 is mounted to one end of slide bar 202. When steering bar 208 is pulled through a rowing motion, slide bar 202 is caused to slide through cylinder 204. Cylinder 204 provides for securing slide bar 202 to row bicycle 200 while allowing motion of slide bar 202 parallel to its axis. Cylinder 204 is affixed to frame 220 by pivot 256. Pivot 256 allows cylinder 204 to rotate through a limited arc above frame 220 to facilitate the rowing motion used to power the row bicycle.

Motive power created by the rowing motion is transferred to drive cable 215. Drive cable 215 is connected to chain 210 by connecting link 211. Chain 210 drives chain drive 238. Chain drive 238 contains a one way dog allowing the reciprocating motion of the chain 210. Drive cable 215 is attached to slide bar 202 by mounting 212. When slide bar 202 is pulled through the rowing motion, drive cable 215 is pulled through a series of pulleys 214, 216, and 218 mounted on frame 220. Pulleys 214, 216, and 218 guide drive cable 215 along frame 220. Chain 210 then engages chain drive 238.

After passing around chain drive 238, chain 210 attaches to spring 224. Spring 224 maintains tension in chain 210 while allowing chain 210 to be pulled around chain drive 238. After chain 210 has been pulled around chain drive 238, and slide bar 202 is pushed forward in the rowing motion, spring 224 retracts chain 210. The other end of spring 224 is attached to cable 232. Cable 232 is connected to bracket 230, which is mounted on frame 220, thus providing an anchor point. Chain drive 238 is mounted on wheel 228. Wheel 228 and chain drive 238 share a common axis of rotation 240. Axis 240 connects wheel 228 and chain drive 238 to frame 220.

Now referring to Figure 8, Figure 8 shows a schematic view of the steering mechanism of row bicycle 200. Row bicycle 200 has a slide bar 202 mounted within a cylinder 204. Cylinder 204 is attached to a mounting 254. Mounting 254 rests upon a pivot 256 which allows slide bar 202 and the cylinder assembly to pivot around axis 270 along with the rowing motion. Cylinder 204 has an inner ring 262 of sufficient width to admit slide bar 202. Thus slide bar 202 is free to slide parallel to the axis of cylinder 204. Slide bar 202 has a notch 260 cut along the top of its length.

Within cylinder 204 is a ring 258 with a guide tab 264 resting within notch 260. This acts to hold the ring's position relative to slide bar 202. Ring 258 thus turns with slide bar 202 when slide bar 202 is rotated. Ring 258 transfers the rotational steering power through a belt 252. Belt 252 runs around the top half of ring 258. Belt 252 then runs down to ring 259. Ring 259 guides belt 252 through a turn of approximately 90°. Belt 252 leaves the cylinder 204 assembly through a opening into mounting 254. Belt 252 then runs to and around the head of the steering fork 250. Belt 252 causes control disc 250 to turn with its movement. Belt 252 then runs back up to ring 259 in a similar manner. Control disc 250 is mounted on top of neck 246. Neck 246 is constrained to turn with control disc 250. Neck 246 is connected to steering fork 236. Neck 246 causes steering fork 236 to turn with its rotation, thus accomplishing the steering of the row bicycle of the invention.

Those skilled in the art will recognize that the wheel mounting forks of the invention may be replaced by wheel mounting beams.

The invention has been described herein in considerable detail in order to comply with the Patent Statutes and to provide those skilled in the art with the information needed to apply the novel principles and to construct and use such specialized components as are required. However, it is to be understood that the invention may be carried out by specifically different equipment and devices, and that various modifications, both as to the equipment details and operating procedures, may be accomplished without departing from the scope of the invention itself.

What is claimed is:

CLAIMS

1. A row bicycle apparatus for a cyclist comprising:
   (a) frame means for mounting a front rolling means and a rear rolling means;
   (b) sliding cyclist support means for supporting the cyclist wherein the sliding cyclist support means is slidably engaged to the frame means;
   (c) rowing power means for transferring rowing power to the row bicycle wherein the rowing power means is attached to the frame means and the rear rolling means ; and
   (d) steering means for providing steering to the front wheel means wherein the steering means is attached to the frame means and the front rolling means.

2. The row bicycle apparatus of Claim 1 wherein the frame means comprises:
   (a) front attachment means for mounting the front rolling means connected to a front of the frame means;
   (b) rear attachment means for mounting the rear rolling means connected to a rear of the frame means; and
   (c) frame connecting means for connecting the front attachment means to the rear attachment means, wherein the frame connecting means supports the sliding cyclist support means.

3. The row bicycle apparatus of claim 1 wherein the sliding cyclist support means comprises:
   (a) slide mounting means for sliding along the frame means connected to the frame means; and
   (b) seat means for supporting the cyclist in a sitting position connected to the slide mounting means.

4. The row bicycle apparatus of claim 3 wherein the slide mounting means comprises a plurality of rolling bearings connected to the seat means disposed to slide the seat means longitudinally along the frame means.

5. The row bicycle apparatus of claim 1 wherein the rowing power means comprises;
   (a) vertical support means for transferring power rotatably attached at one end to the frame means;
   (b) power transmission means for providing power to the rear rolling means wherein the power transmission means is attached to the frame means and further includes a flexible power input;
   (c) flexible power transfer means for engaging the flexible power input; and
   (d) first sprocket means for engaging the flexible power transfer means attached to the vertical support means.

6. The row bicycle apparatus of claim 5 wherein the power transmission means further comprises;
   (a) second sprocket means for engaging the flexible power transfer means, wherein the second sprocket means is attached to the frame means;
   (b) third sprocket means for driving a second flexible power transfer means, wherein the third sprocket means is attached to the second sprocket means; and
   (c) fourth sprocket means for driving the rear rolling means wherein the fourth sprocket means rotationally engages the rear rolling means and wherein the fourth sprocket means engages the second flexible power transfer means.

7. The row bicycle apparatus of claim 1 wherein the second sprocket means further comprises a one way dog.

8. The row bicycle apparatus of claim 1 wherein the front rolling means and rear rolling means each comprise a wheel.

9. The row bicycle apparatus of claim 1 wherein the fourth sprocket means further comprises a one way dog.

10. The row bicycle of claim 5 wherein the first sprocket means further comprises an eccentric cam.

11. The row bicycle of claim 5 wherein the first flexible power transfer means further comprises a chain.

12. The row bicycle of claim 5 wherein the second flexible power transfer means further comprises a chain.

13. The row bicycle of claim 5 wherein the first flexible power transfer means further comprises:
   (a) a cable to engage the first sprocket means;
   (b) a cable to chain connector connected to the cable; and
   (c) a chain to engage the second sprocket means connected to the cable to chain connector.

14. The row bicycle of claim 1 wherein the steering means further comprises:
   (a) vertical support means for transferring power rotatably attached at one end to the frame means;
   (b) steering bar means for actuating a first hydraulic piston means for controlling a first hydraulic cylinder means for transferring steering power wherein the first hydraulic cylinder means has a steering control line output;
   (c) steerable front attachment means for mounting the front rolling means connected to a front of the frame means wherein the steerable front

attachment means further includes an actuating arm means for directing the steerable from attachment means; and

(d) second hydraulic cylinder means for driving a second hydraulic piston wherein the second hydraulic cylinder has a steering control line input connected to the steering control line output wherein the second hydraulic piston engages the actuating arm means to steer the front rolling means.

15. The row bicycle apparatus of claim 14 wherein the vertical support means further comprises a rowing bar.

16. The row bicycle apparatus of claim 14 wherein the steerable front attachment means comprises front fork means for mounting the front rolling means.

17. The row bicycle apparatus of claim 14 wherein the steering control line input and steering control line output comprise at least two hydraulic lines.

18. The row bicycle apparatus of Claim 1 wherein the steering means further comprises a hydraulic steering means.

19. A mechanical steering mechanism apparatus for a row bicycle having a steerable wheel, the mechanical steering mechanism comprising:

(a) control linkage means for steering the steerable wheel;

(b) transmission means for turning the control linkage means, wherein the transmission means is connected to the control linkage means and wherein the transmission means has a steering shaft input;

(c) steering shaft means for transmitting steering force, wherein the steering shaft means is connected to the steering shaft input and wherein the steering shaft means has a control end;

(d) pinion gear means for attachment to the end of the control shaft wherein the pinion gear means is in contact with a control rack means and wherein the control rack means has a steering input rack means;

(e) steering shaft means connected at one end to the rack drive means and at the other end to a means for controlling the steering shaft means; and

(f) power coupling means attached to the steering shaft means to provide power through a power transmission means to power the row bicycle.

20. The mechanical steering apparatus of Claim 19 wherein the power coupling means comprises chain gear drive means disposed to surround the control rack means thereby embedding the control rack within the power coupling means such that the power coupling means can rotate around the control rack means.

21. A steering apparatus for a row bicycle providing the ability to row and steer simultaneously, wherein the row bicycle comprises a front fork for mounting a front wheel, wherein the front fork has a control neck input, and wherein the steering apparatus comprises;

(a) control disk means coaxial with a control neck connected to the control neck;

(b) bearing means for mounting the control neck to the row bicycle;

(c) sliding shaft means for providing rowing power and control force, wherein the sliding shaft means has a control surface disposed to control the control disk means; and

(d) bearing means for supporting the sliding shaft means, wherein the bearing means is connected to the row bicycle on a pivot.

22. The steering apparatus of claim 21, wherein the pivot has an axis, and wherein the control disk means further comprises a belt connecting the control disk to the control surface, wherein the belt passes through the axis.

23. The steering apparatus of claim 21 wherein the control surface comprises a registered tongue and groove.

24. The row bicycle apparatus of claim 1, wherein the front rolling means is a steerable wheel, and wherein the steering means further comprises:

(a) control linkage means for steering the steerable wheel;

(b) transmission means for turning the control linkage means, wherein the transmission means is connected to the control linkage means and wherein the transmission means has a steering shaft input;

(c) steering shaft means for transmitting steering force, wherein the steering shaft means is connected to the steering shaft input and wherein the steering shaft means has a control end;

(d) pinion gear means for attachment to the control end of the steering shaft wherein the pinion gear means is in contact with a control rack means and wherein the control rack means has a steering input rack means;

(e) transfer shaft means connected at one end to the rack drive means and at the other end to a means for controlling the transfer shaft means; and

(f) power coupling means attached to the steering shaft means to provide power through a power transmission means to power the row bicycle.

25. The row bicycle apparatus of Claim 24 wherein the power coupling means comprises chain gear drive means disposed to surround the control rack means thereby embedding the control rack means within the power coupling means such that the power coupling means can rotate around the control rack means.

26. The row bicycle apparatus of claim 1 where the steering means provides an ability to row and steer simultaneously, wherein the row bicycle apparatus further comprises a front fork for mounting a front wheel, and wherein the front fork has a control neck input, and wherein the steering means further comprises:

(a) control disk means coaxial with the control neck connected to the control neck;

(b) bearing means for mounting the control neck to the row bicycle;

(c) sliding shaft means for providing rowing power and control force, wherein the sliding shaft means has a control surface disposed to control the control disk means; and

(d) bearing means for supporting the sliding shaft, wherein the bearing means is connected to the row bicycle on a pivot.

27. The steering apparatus of claim 26, wherein the pivot has an axis, and wherein the control disk further comprises a belt connecting the control disk to the control surface, wherein the belt passes through the axis.

28. The steering apparatus of claim 26 wherein the control surface comprises a registered tongue and groove.

29. The row bicycle apparatus of claim 1 wherein the rowing power means comprises;
    (a) ratcheting sprocket means for powering the rear rolling means rotatably connected to the frame means; and
    (b) sliding shaft means for transferring power, wherein the sliding shaft means is slidably attached to the steering means and the sliding shaft means further comprises a means to connect a flexible power transfer means for transferring power to the sprocket means.

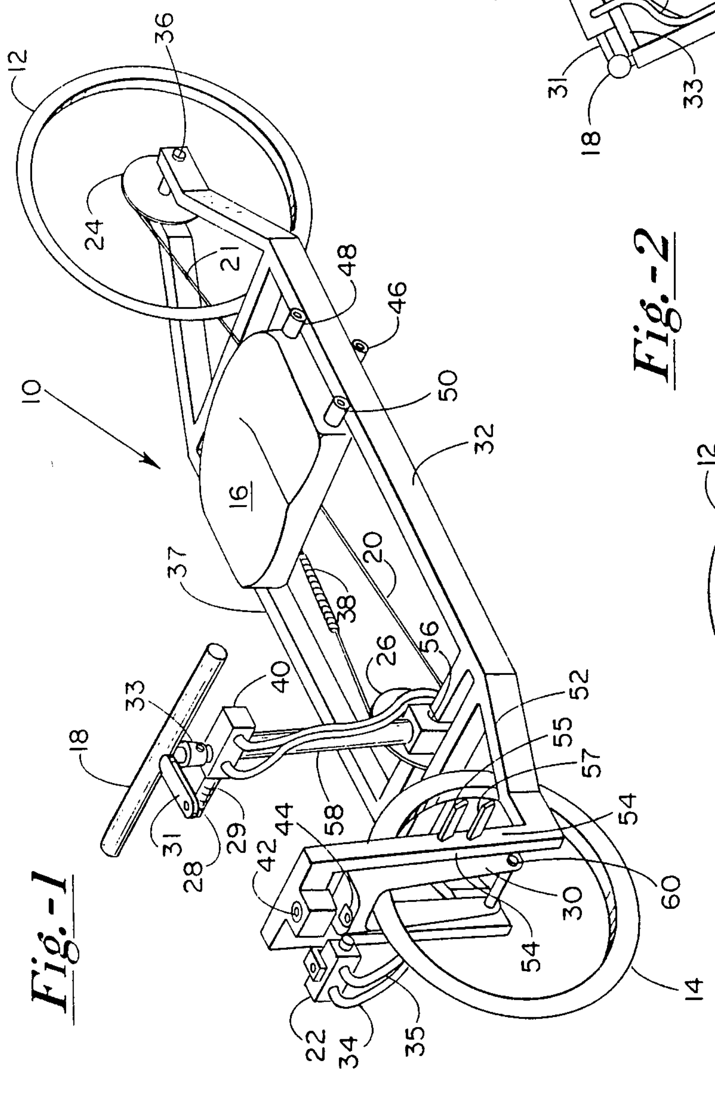
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Fig.-1

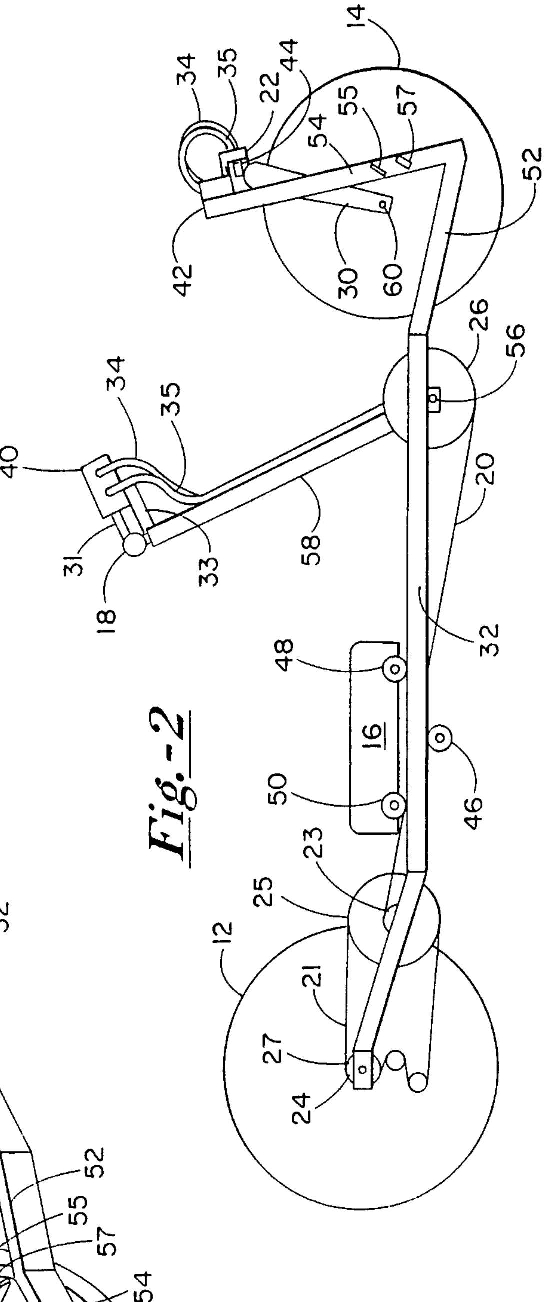
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Fig.-2

Fig.-3

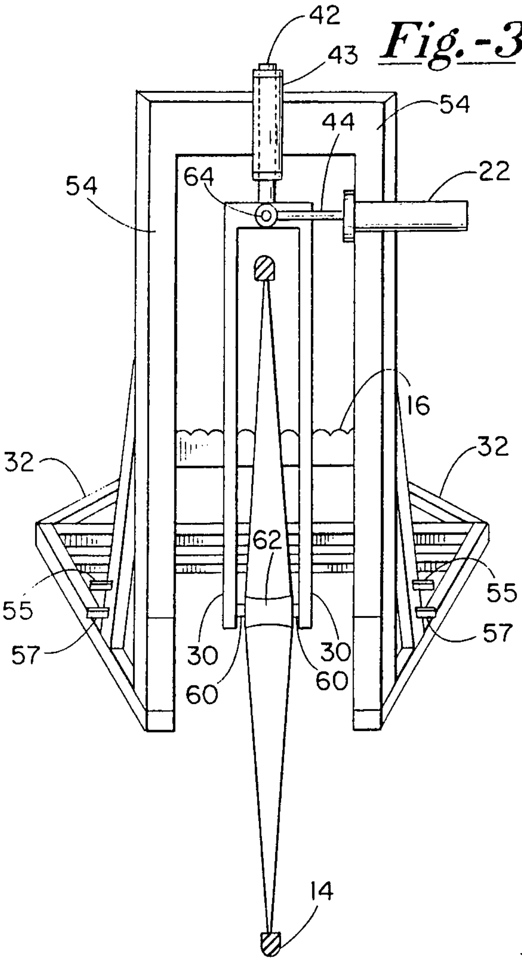


Fig.-4

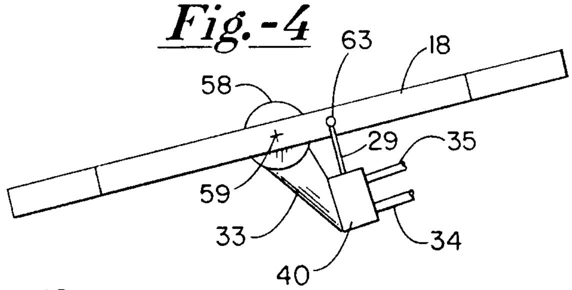


Fig.-5

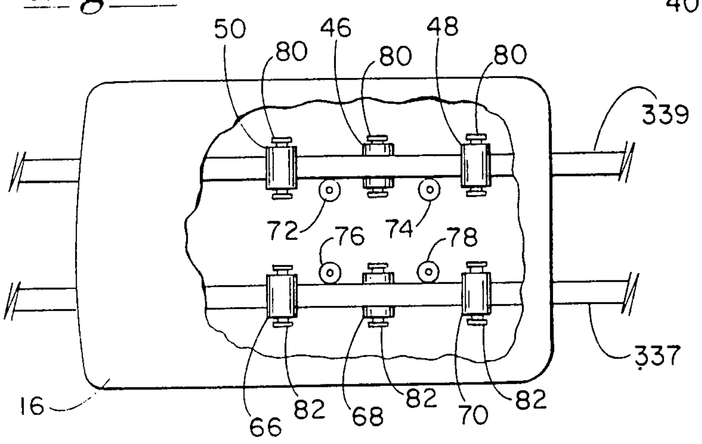
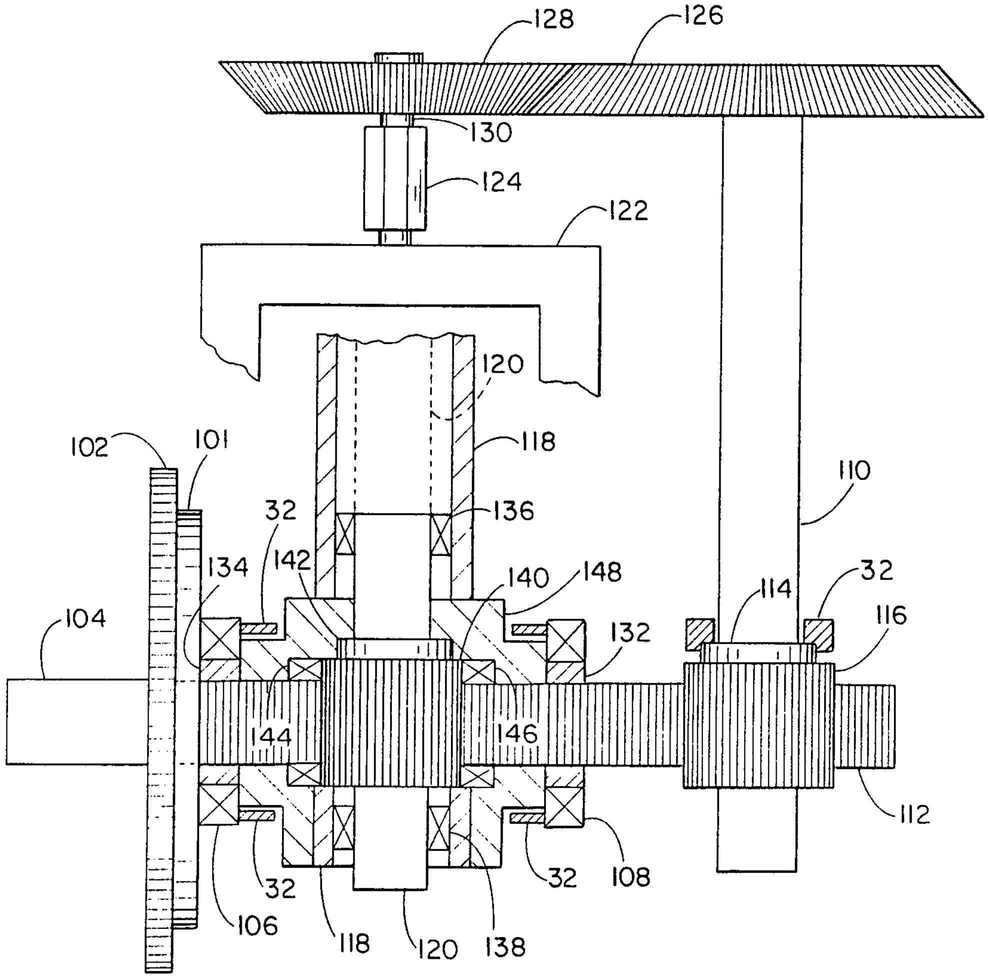


Fig.-6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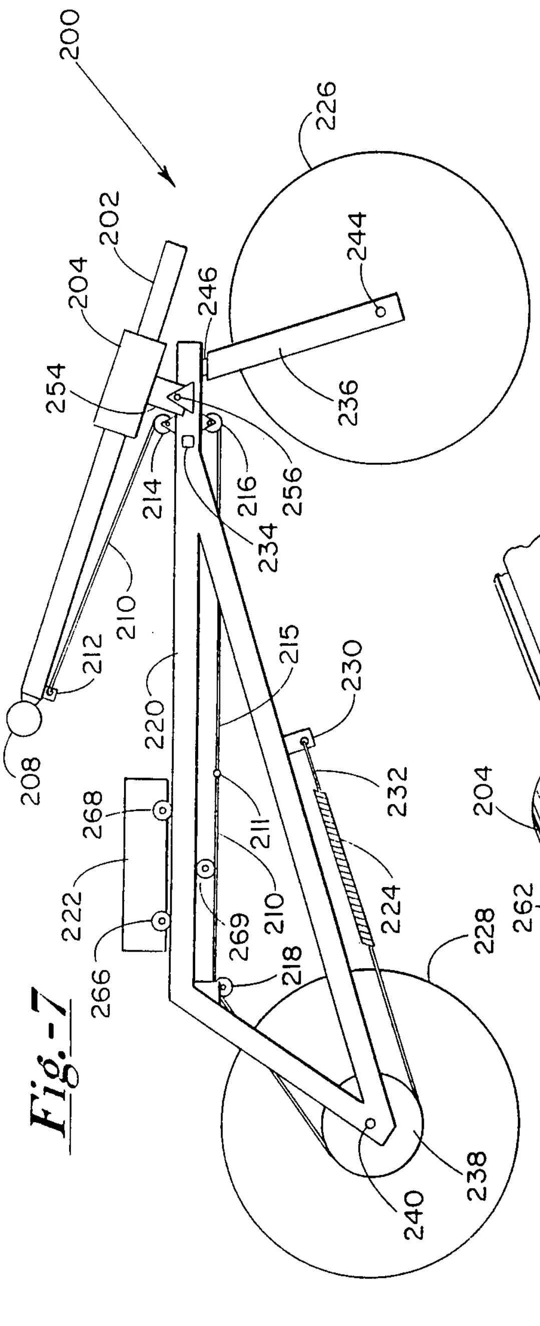
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Fig.-7

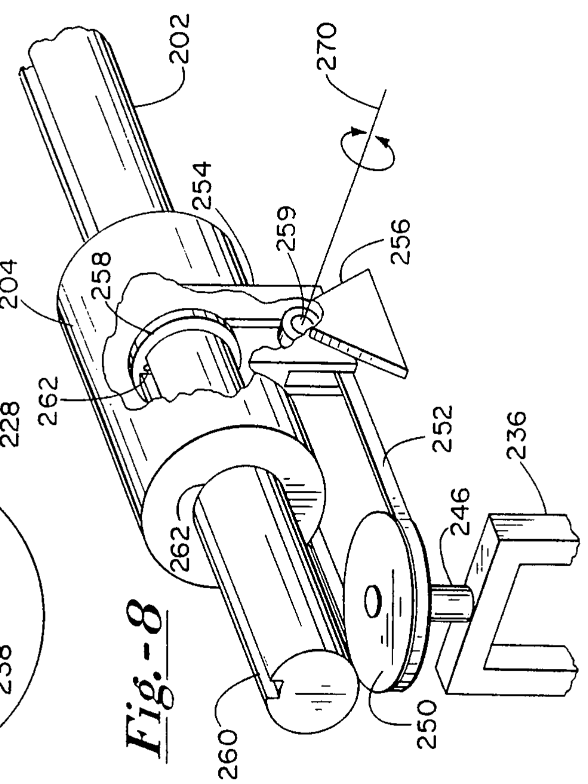
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Fig.-8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/01519

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B62M 1/16
US CL :280/220, 244, 252, 276, 92
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)

U.S. : 280/220, 221, 224, 226.1, 234, 230, 240, 244, 227, 246, 252, 253, 255, 263, 270, 271, 272, 274, 276, 277, 279, 92; 180/132, 79

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

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

APS of U.S. patents since 1975

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	EP, A, 0,461,286 (Horst) 18 December 1991, see entire document.	1-6, 8, 11, — 12, 7, 9, 14-18
Y	US, A, 4,632,414 (Ellefson) 30 December 1986, see entire document.	7, 9
Y	US, A, 4,179,135 (Slater) 18 December 1979, see figure 4.	14-18
A	US, A, 4,305,600 (Mendez) 15 December 1981, see entire document.	1-9, 11, 12
A	US, A, 4,796,907 (Geller) 10 January 1989, see entire document.	1-9, 11, 12

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:

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

"E" earlier document 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
31 MARCH 1994	29 APR 1994
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer Anne Marie Boehler Telephone No. (703) 305-0422

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/01519

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 3,006,427 (Van Der Lely) 31 October 1961, see entire document.	1-9, 11, 12

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Group 1: Figures 1-4, drawn to a hydraulic steering system.
Group 2: Figure 6, drawn to an alternative steering linkage.
Group 3: Figure 7 and 8, drawn to an alternative steering and drive arrangement.
Groups 1, 2 and 3 are drawn to mutually exclusive embodiments of rowing vehicles.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-9, 11, 12 and 14-18

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.