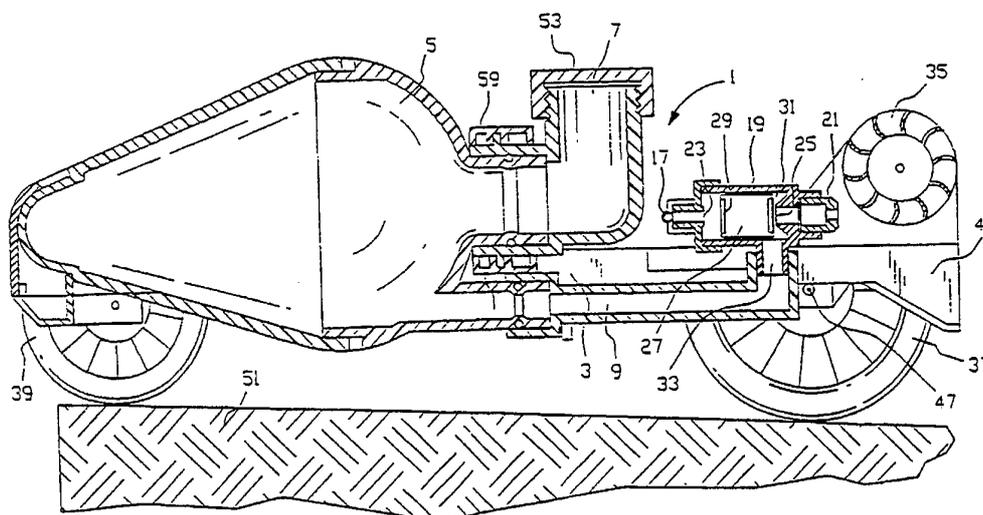




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(54) Title: PRESSURIZED FLUID DRIVEN TOY VEHICLE



(57) Abstract

The present invention is a pressurized fluid driven vehicle and launcher toy (1). It includes a pump (101), a vehicle (3; 201), a latch mechanism (88), and release means (87). The pump has a connection (82) for pumping air to a pressurizable reservoir (5) in the vehicle for receiving air or liquid and air. The reservoir has an air inlet (11; 217) for connection to the pump, and the vehicle has a jet tube (21; 209) in fluid communication with the reservoir for releasing pressurized air or pressurized air and water from the reservoir through a jet tube outlet (25) to move the toy vehicle. A valving arrangement (19, 23, 27, 29, 31) interacts with the pump and reservoir to allow pressurization of fluid within the reservoir when the pump is connected to the air inlet and propulsive release of the pressurized fluid from the reservoir through the jet tube outlet when the pump is disconnected from the air inlet. A turbine wheel (35, 213) may be located on the vehicle and in fluid communication with the jet tube outlet, and a motive mechanism (37, 41, 42, 43, 44, 45, 46; 211, 213) is connected to the turbine wheel to move the toy vehicle along surfaces, e.g., land or water. The motive mechanism could be wheels (37, 39, 55, 57), a propeller (215), water paddle or other motive mechanism.

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PRESSURIZED FLUID DRIVEN TOY VEHICLE**Background of the Invention****Field of the Invention**

5 The present invention is directed to a pressurized fluid driven toy. More specifically, it is directed to a toy which propels a mobile toy vehicle (i.e. a car, a tank, truck or other rolling, sliding or propeller driven vehicle). Further, the present invention utilizes a liquid fill reservoir and pump whereby liquid is placed in a reservoir on
10 the vehicle section of the toy and air therein is subsequently pumped up to a significant positive pressure, and the pressurized air and water are subsequently released to drive a turbine for propulsion. Thus, the present invention pertains in general to motive type toys which are launched by hand
15 operation and the launched portion or vehicle may be on land, ice, or other surface, or on or under water. A second version of the invention does not use water or any liquid but uses just pressurized air. The operation and arrangement of the components is the same, the only difference being that the
20 container does not need a fill port and there should be adjustment to the nozzle diameter and to the gearing to accommodate air without water.

Description of the Prior Art

25 Toys involving launchers have been around for at least thirty or forty years and apparently emerged with modern rocketry, although not all such toys pertain directly to rockets. Over the years various types of jet-powered toys have been developed which rely upon pressurized liquid or air within a container in the projectile or transporter and/or
30 rely upon pneumatic launching.

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United States Patent No. 3,740,896 to Marvin Glass *et al.* describes a jet-powered vehicle wherein a wheeled vehicle has a chamber or container within it and has a launching device which includes an air pump with a one-way valve. There is also clamp means for holding the vehicle in the charging position and a trigger means for releasing the clamping device following the charging of the chamber to permit the vehicle to be propelled by means of reaction of the jet drive.

United States Patent No. 2,410,682 to Richardson describes jet propelled toys, including boats and cars which rely upon deflation of an inflatable body for propulsion.

United States Patent No. 3,577,677 to Bennett describes a gravity actuated wheeled toy vehicle with auxiliary jet propulsion means. The jet propulsion is operated by a trigger actuated by the vehicle passing over a peg. When the trigger hits the peg, a plug is opened and the jet propulsion thrusts the vehicle forward.

United States Patent No. 5,197,452 issued to the inventors herein describes a liquid jet propelled transporter and launcher toy which includes a pressurizing mechanism to pressurize air stored with liquid for launching a transporter. A trigger release mechanism is used to fire the transporter.

United States Patent Nos. 5,074,437 and 5,150,819 issued to Johnson and D'Andrade describe single tank and double tank pump up pressurized tank water guns which are commercially known as "Super Soakers" (trademark of Larami Corporation, Philadelphia, PA) and have experienced substantial commercial success due to their ability to project streams of water over unusual distances and for extended time periods. These patents merely illustrate pressurizable pump-based toys.

Notwithstanding the prior art in this field, no patent teaches or renders obvious the present invention device which utilizes the unique valving arrangement of the present

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invention or a pump with a pump connection assembly which affects the operation of the valving arrangement.

Summary of the Invention

5 The present invention is a pressurized fluid driven vehicle and launcher toy. It includes a pump contained within a housing, a one-way valve connected to the pump, a vehicle, a latch mechanism, and release means. The pump has a pump connection assembly and is capable of pumping air to a toy vehicle reservoir. The vehicle includes a pressurizable
10 reservoir therein for receiving air or liquid and air, an air inlet means for connecting the reservoir to the pump, and a jet tube in fluid communication with the reservoir for releasing air or air and liquid from the reservoir through a jet tube outlet to move the toy vehicle. A one-way valve is
15 in fluid connection with the pump and the reservoir permitting flow of air only from the pump to the reservoir when the pump is connected to the air inlet means. A vehicle latch mechanism is located on either of the pump or the vehicle to removably connect the vehicle and the pump. A common valving
20 arrangement connects the reservoir and the jet tube, the common valving arrangement having a multi-functional valve traveling between first and second positions. The valve in the first position allows air to be pumped into the reservoir without exiting the jet tube when the pump is connected to the
25 air inlet and air is pumped into the reservoir. The valve in the second position allows pressurized air or pressurized air and liquid to exit the jet tube outlet when the pump is not connected to the air inlet. A latch releasing means for releasing the latch mechanism is also provided. The foregoing
30 structure is such that the pump may be removably connected to the air inlet means of the reservoir for pumping air into the reservoir such that air may be pumped into the reservoir when the pump is connected to the air inlet, and the vehicle subsequently may be released with pressurized air or

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pressurized air and liquid exiting the jet tube so as to move the vehicle when the pump is not connected to the air inlet.

In one embodiment, a turbine wheel is located on the vehicle in fluid connection with the outlet of the jet tube, and a motive mechanism is connected to the turbine to move the toy vehicle along surfaces, e.g. land or water. The motive mechanism could include wheels, a propeller, water paddle or other motive mechanism.

Brief Description of the Drawings

The present invention as described herein will be more fully understood and appreciated when taken in conjunction with the drawings appended hereto. Those drawings are as follows:

Figure 1 shows a left side vertical cross-sectional view of one embodiment of a present invention toy vehicle;

Figure 2 shows a partial top plan view of the same vehicle shown in Figure 1;

Figure 3 shows a partial side vertical cross-sectional view of a turbine gear housing mechanism which may be used in the toy vehicle shown in Figures 1 and 2;

Figure 4 shows side vertical cross-sectional view with a partial view of the toy vehicle shown in Figures 1 and 2 and with a full side vertical cross-sectional view of a pump connected to the toy vehicle which comprises the entire present invention; and,

Figure 5 shows a partial rear vertical cross-sectional view of another embodiment of a boat toy vehicle of the present invention.

Detailed Description of the Invention

The present invention is a pressurized fluid driven vehicle and launcher toy. "Pressurized fluid" is used herein to mean pressurized air or gas, as well as a combination of a liquid with a pressurized air pack. In other words, pressurized fluid could be air or other gas pumped into a

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reservoir, or it could be a reservoir partially filled with water or other liquid and subsequently pressurized with air or other gas. The launcher of the present invention toy is inherently the pump, as described herein. "Pump" as used
5 herein should be taken to mean the pumping mechanism, as well as the launcher. However, it should be noted that while the pump and the launcher are one and the same device in the preferred embodiments of the present invention, a separate launch pad could be constructed which would be physically
10 remote or unattached from a pump mechanism and would still be equivalent to the present invention as claimed herein.

The vehicle of the present invention includes a pressurizable reservoir for receiving gas or liquid and gas. It includes an air inlet means for connection to a pump as
15 well as a jet tube in fluid communication with the reservoir for releasing the pressurized air or the pressurized air and liquid from the reservoir. The propulsive force of the pressurized air or pressurized air and liquid exiting rearwardly of the jet tube to the ambient atmosphere would be
20 sufficient to propel the vehicle forward. In the illustrated embodiments, a turbine wheel is located on the vehicle in fluid connection with the outlet or nozzle of the jet tube, positioned so that the released pressurized air or air and water from the reservoir impinges upon the turbine wheel to
25 rotate the turbine wheel. The vehicle also includes motive means connected to the turbine so as to move the toy vehicle along a surface when the turbine is rotated. By "motive means" is meant some mechanism which comes into contact with something other than the toy so as to move or motivate the toy
30 forward. This motive means could take the form of one or more wheels, paddles, reciprocating skids, robotic feet, skids or tractions such as treads on a tank, or a propeller or any other motive means which would move the toy vehicle along or with respect to a surface such as land or water.

35 There is also a pump included with the present invention which, as mentioned, generally acts as a launcher as

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well as a pump. The pump has a housing and a pump connection assembly and is capable of pumping air to the toy vehicle reservoir. The pump connection assembly is designed to be removably connected to the air inlet means of the

5 pressurizable reservoir of the toy vehicle. The pump also has a one-way valve connected to it so as to permit the flow of air or other gas from the pump to a toy vehicle reservoir and not vice versa. An option could include a second, opposite one-way valve which would open back to the pump only after

10 pressure has reached a certain predetermined maximum safe level. This second, opposite one-way valve would merely act as a safety release to prevent excess pressurization.

The invention also includes a vehicle latch mechanism located on either the pump or the vehicle as well as

15 means for releasing the latch mechanism. In preferred embodiments, the latch mechanism would be connected to the air inlet means of the pressurizable reservoir or to the pump connection.

In the present invention, a user attaches the pump connection assembly to the air inlet of the pressurizable tank of the toy, pumps up the pressure so as to achieve a maximum allowable pressure and, since the latch mechanism is preferably attached to the pump connection assembly, when the pump connection is made with the pressurizable reservoir air

20 inlet, the latch mechanism is also secured. Once having pressurized the toy, a user may simultaneously separate the vehicle from the pump and release the vehicle latch mechanism by a simple, single movement, such as a depression of the release means of the latch mechanism. Thus, when a user

25 releases the latch mechanism and thereby removes the pump, a valve is opened to release the pressurized fluid from the reservoir of the toy vehicle and this fluid either directly propels the vehicle forward by a rocket-type of propulsion or, as in the illustrated embodiments, the pressurized fluid

30 impinges upon the turbine so as to move or drive the turbine

35

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and thereby move or drive the motive means of the vehicle to advance it forwardly.

5 While there may be separate valves to control the air inlet to the pressurizable reservoir and/or release the pressurized fluid from the reservoir, in preferred
embodiments, a common valving assembly is used. In the most preferred embodiments, the common valving assembly comprises a
10 shuttle valve that reciprocates back and forth to have a first position and a second position. In its first position, the shuttle valve is opened to the air inlet but closes the jet tube. In its second position, the opposite occurs, i.e., the jet tube is opened and the air inlet is closed.

Referring now to Figure 1, there is shown present invention toy 1 showing the vehicle in a side vertical cross-sectional view without the pump launcher. Referencing both
15 Figures 1 and 2, Figure 2 showing a partial top plan view of the vehicle shown in Figure 1, with identical parts being identically numbered, the vehicle includes frame 3 and pressurizable reservoir 5. Reservoir 5 has a liquid inlet 7 with a cap 53. Collar 59 maintains reservoir 5 and liquid inlet 7 in its stationary position on frame 3 of the vehicle. This liquid inlet 7 and cap 53 are optional, as pressurizable reservoir 5 could be operated with gas only, i.e. with air, and without any liquid such as water. However, in this
20 embodiment, the toy 1 is intended to be operated using a pressurizable fluid arrangement with air and water. Thus, a user would fill reservoir 5 to about half its volume to two-thirds its volume with liquid and would then seal the tank by screwing cap 53 onto liquid inlet 7.

30 There is a common tube 9 which acts both as pressurized air inlet means and jet tube outlet means. This common tube 9 is connected at one end to reservoir 5, and at the other end to inlet tube 33 which is connected to a common valving arrangement housing 19. There is a pressurized air
35 inlet 11 with lip 89 identified in the top plan view of Figure 2, and this is connected via tube 13, elbow 15 and tube 17 to

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housing 19 of the common valving arrangement. As shown in Figure 1, common valving arrangement housing 19 is connected at one end to jet tube 21 and at the other end to inlet 23 extending from tube 17, thereby being connected to pressurized air inlet 11. Jet tube outlet 25 connects jet tube 21 to the open area within common valving arrangement housing 19 and this area contains shuttle valve 27 having a first seal 29 which is located on the left side, and second seal 31 located on the right side.

Shuttle valve 27 is shown in its first position, i.e. to the right, so that inlet 23 is open and one may pump air into common valving arrangement housing 19 where it will pass around the periphery of first seal 29 and down inlet tube 33 to common tube 9 and into reservoir 5. This will be described in more detail in conjunction with Figure 4 below. Shuttle valve 27 has a second position where it would be biased to the left. This occurs when a decrease in pressure is created at inlet 23, resulting from the disconnection and removal of a pump and this decrease in pressure, compared to the pressure on the opposite side of shuttle valve 27 which is in communication with the pressurized fluid in reservoir 5, causes shuttle valve 27 to move to its left to a second position in which inlet 23 is now closed and jet tube outlet 25 is now opened. Thus, in its second position, shuttle valve 27 will be positioned to close the air inlet from pumping and open the jet tube.

When jet tube outlet 25 is opened, pressurized fluid (i.e. gas and liquid or gas alone) exits from reservoir 5, through tube 9 and tube 33 and in the illustrated embodiment impinges upon turbine, sometimes referred to as turbine wheel, 35. Turbine 35 is located on the upper portion of tail fin 49 of the vehicle, as shown. This causes rotation of turbine 35 and it may have a direct drive relationship or a geared down relationship so as to rotate rear wheel 37. Thus, when the pressure is released the wheel 37 will be compelled to rotate so as to advance the vehicle forward and it will roll on front

wheels as well as rear wheels, exemplified by front wheel 39 and rear wheel 37 and, as shown in Figure 2, front wheel 55 and rear wheel 57 against surface 51, shown in Figure 1.

5 Referencing now Figure 3 taken in conjunction with Figures 1 and 2, Figure 3 shows a partial side vertical cross-sectional view of gear housing 41, turbine drive shaft 42 with drive gear 44, first gear 43, second gear 45 and rear wheel axle 47. As now can be seen and as indicated by the arrows, when the turbine and therefore, turbine drive shaft 42 and
10 drive gear 44, rotate counter-clockwise, first gear 43 rotates clockwise, second gear 47 rotates counter-clockwise and this rotates axle 47 counter-clockwise so as to advance toy 1 forward when turbine 35 is rotated.

15 As previously indicated, if desired, turbine 35 and gear housing 41 with its associated gears could be eliminated, and jet tube outlet 25 could be in communication with the ambient atmosphere. In that embodiment, the pressurized fluid exiting rapidly from jet tube outlet 25 would propel the vehicle in a forward direction.

20 Figure 4 shows a partial side vertical cross-sectional view of a section of present invention toy 1 and includes a side vertical cross-sectional view of pump 101. Note again that the parts identical to those shown in the previous figures are identically numbered and will not be
25 rediscussed here. Tube 83 is connected to pump 101 as shown. Pump connection assembly 82 is attached to tube 83 by collar 85 as shown. Pump connection assembly 82 includes insertable portion 84 which is inserted into pressurized air inlet 11. Pump connection assembly 82 also includes O-ring 86 to provide
30 a seal between insertable portion 84 and air inlet 11, and a release means 87 in the form of an extended lever member, as shown in Figure 4. Pump connection assembly 82 also includes vehicle latch mechanism 88 that snaps onto lip 89 of
35 pressurized air inlet 11 when pump 101 is connected thereto by insertion of insertable portion 84 into pressurized air inlet 11. When the user wishes to release the vehicle from the

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pump, release means 87 is depressed and this lifts up latch mechanism 88 so as to render pump 101 removable from the vehicle.

When pump 101 is removed from the vehicle, pressure in tube 13 will tend to push insertable portion 84 out of inlet 11. At this point, the shuttle valve shifts from its first position to its second position due to the pressure drop as described above, and, through movement of turbine 35 caused by pressurized fluid exiting jet tube 21, or through the rocket propulsion caused directly by the pressurized fluid exiting jet tube 21 directly to the ambient atmosphere, the vehicle is propelled forward.

As mentioned, pump 101 is shown in Figure 4 as connected to toy vehicle 1. Pump 101 includes a piston support 91 with a piston housing 93 and a piston rod 95, as well as a piston 96. Piston pump handle 97 covers the outer end of piston rod 95 and may be moved in and out so as to pump air into the reservoir 5 through one-way valve 99 located adjacent to tube 83 as shown. Pump fitting 81 supports piston rod 95 and piston housing cap 92. Air is taken into piston housing 93 at the opening around piston rod 95 at pump fitting 81. This occurs when piston pump handle 97 is pulled outwardly and ring 90 moves away from the sealing position and against the inlet ridge 98 and air fills piston housing 93. When piston pump handle 97 is pushed inwardly, the air within the piston housing is forced through one-way valve 99 into reservoir 5 via the tubing mentioned above and the liquid in the reservoir, if any, such as water, is maintained with a pressurized air volume above it. Further pumping increases the air pressure in reservoir 5 as well as in the tubing mentioned, including pressurized air inlet 11 and tube 13, etc. As mentioned, when the release means 87 is depressed, a decrease in the pressure in the aforesaid tubing causes the shuttle valve 27 to move to its second position and thereby launch the vehicle forward. As shown in Figure 4, there is a

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pump base 79 which acts as a handle so as to enable the user to stabilize the pump during pumping and subsequent release.

Referring now to Figure 5, there is shown a rear vertical cross-sectional view of an alternative embodiment present invention in the form of a toy boat 201. This includes a hull 205 with walls such as wall 203. Contained in the hull would be essentially the same reservoir and connections shown in conjunction with the wheeled vehicle of Figures 1 through 4, except that the valving arrangement housing 207 would have the jet tube 209 extending therefrom at right angles to the direction of travel so as to rotate turbine 213 contained in gear housing 211 along an axis consistent with the direction of travel. In this manner, the turbine 213 and gearing (not shown) will drive propeller 215 as shown in the figure, so as to advance toy boat 201 forward. Air inlet 217 is shown as a cut tube but would extend from the rear of the boat to enable attachment of a pump and a latch mechanism with release means.

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

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WHAT IS CLAIMED IS:

1. A pressurized fluid driven vehicle and launcher toy, which comprises:

(a) a pump contained within a housing, said pump having a pump connection assembly and being capable of pumping air to a toy vehicle reservoir;

(b) a vehicle which includes a pressurizable reservoir therein for receiving air or liquid and air, air inlet means for connecting said reservoir to said pump, a jet tube in fluid communication with said reservoir for releasing air or air and liquid from said reservoir through a jet tube outlet to move said toy vehicle;

(c) a one-way valve in fluid connection with said pump and said reservoir permitting flow of air only from said pump to said reservoir when said pump is connected to said air inlet means;

(d) a vehicle latch mechanism located on either of said pump or said vehicle to removably connect said vehicle and said pump;

(e) a common valving arrangement connecting said reservoir and said jet tube, said common valving arrangement having a multi-functional valve traveling between first and second positions, said valve in said first position allowing air to be pumped into said reservoir without exiting said jet tube when said pump is connected to said air inlet and air is pumped into said reservoir, said valve in said second position allowing pressurized air or pressurized air and liquid to exit said jet tube outlet when said pump is not connected to said air inlet; and

(f) latch releasing means for releasing said latch mechanism;

whereby said pump may be removably connected to said air inlet means of said reservoir for pumping air into said reservoir such that air may be pumped into said reservoir when said pump is connected to said air

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inlet, and said vehicle subsequently may be released with pressurized air or pressurized air and liquid exiting said jet tube outlet so as to move said vehicle when said pump is not connected to said air inlet.

2. The toy of claim 1 wherein said vehicle is a toy amphibious vehicle.

3. The toy of claim 1 wherein said vehicle is a toy land vehicle.

4. The toy of claim 1 wherein said pump connection assembly and said latch mechanism for releasing said vehicle from said pump are interconnected.

5. The toy of claim 1 wherein said vehicle further comprises a turbine wheel on said vehicle in fluid connection with said jet tube outlet, and motive means connected to said turbine, whereby pressurized air or pressurized air and liquid drives said turbine to drive said motive means to move said vehicle.

6. The toy of claim 1 wherein said reservoir also includes an inlet for adding a liquid to said reservoir.

7. The toy of claim 3 wherein said reservoir also includes an inlet for adding a liquid to said reservoir.

8. The toy of claim 5 wherein said vehicle is a boat and said motive means comprises a propeller.

9. The toy of claim 5 wherein said land vehicle is a wheeled vehicle and said motive means comprises at least one drive wheel.

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10. The toy of claim 1 wherein said multi-functional valve in said first position opens said air inlet means and closes said jet tube, and said multi-functional valve in said second position closes said air inlet means and opens said jet tube, relative to said reservoir.

11. The toy of claim 10 wherein said multi-functional valve is a shuttle valve which moves in a reciprocating fashion between said first position and said second position.

12. The toy of claim 11 wherein said shuttle valve is biased to its first position by air being pumped therethrough to said reservoir, and, when said reservoir is pressurized, is biased to its second position when said pump is disconnected.

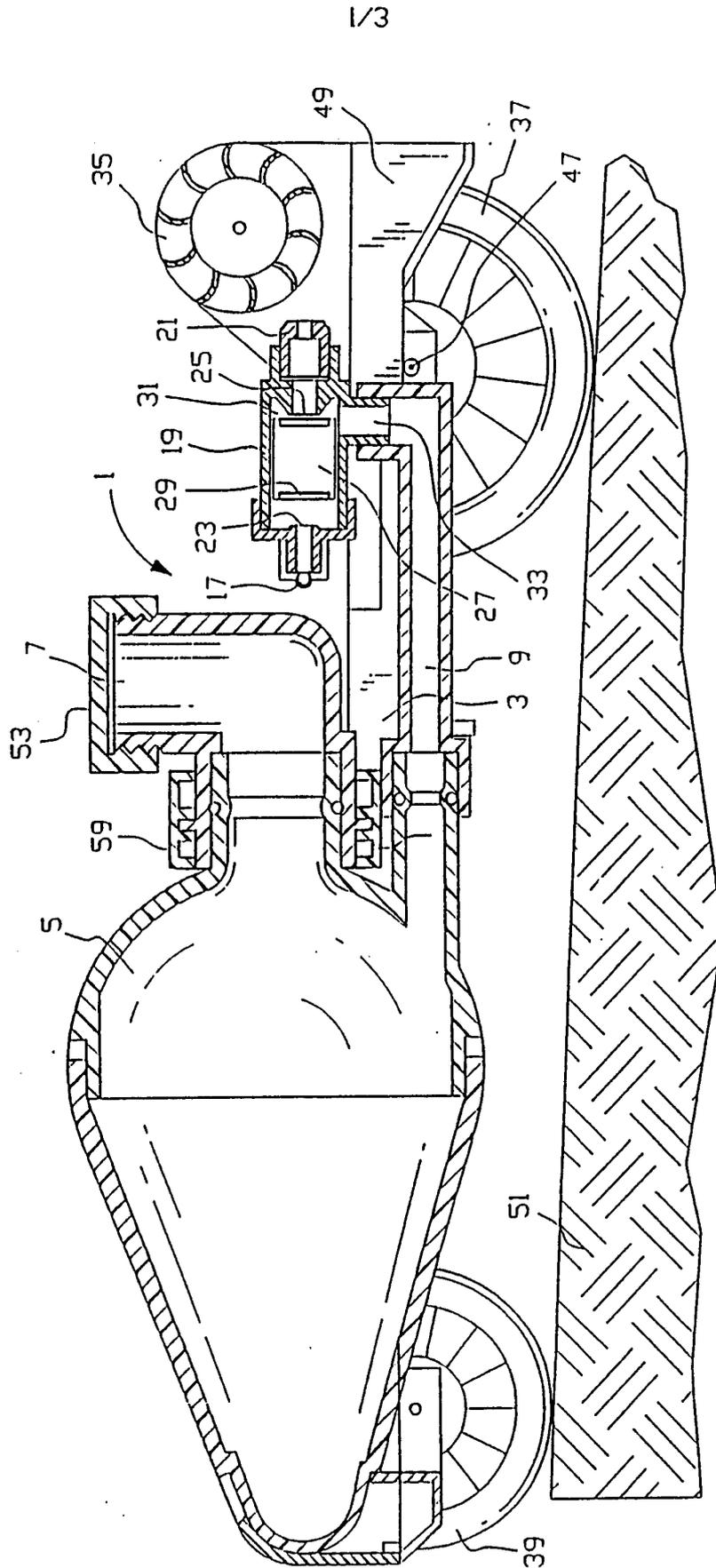
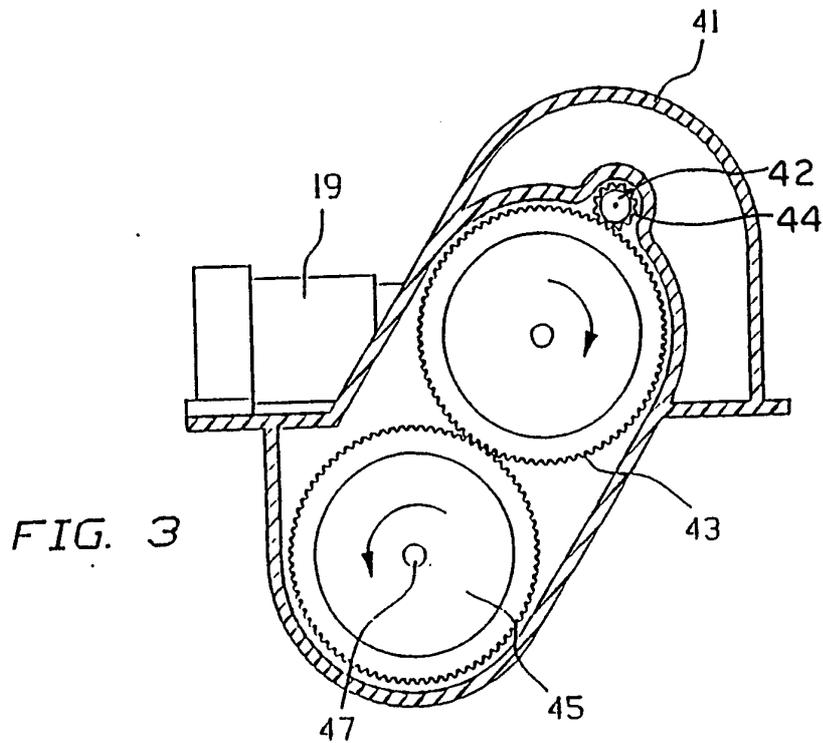
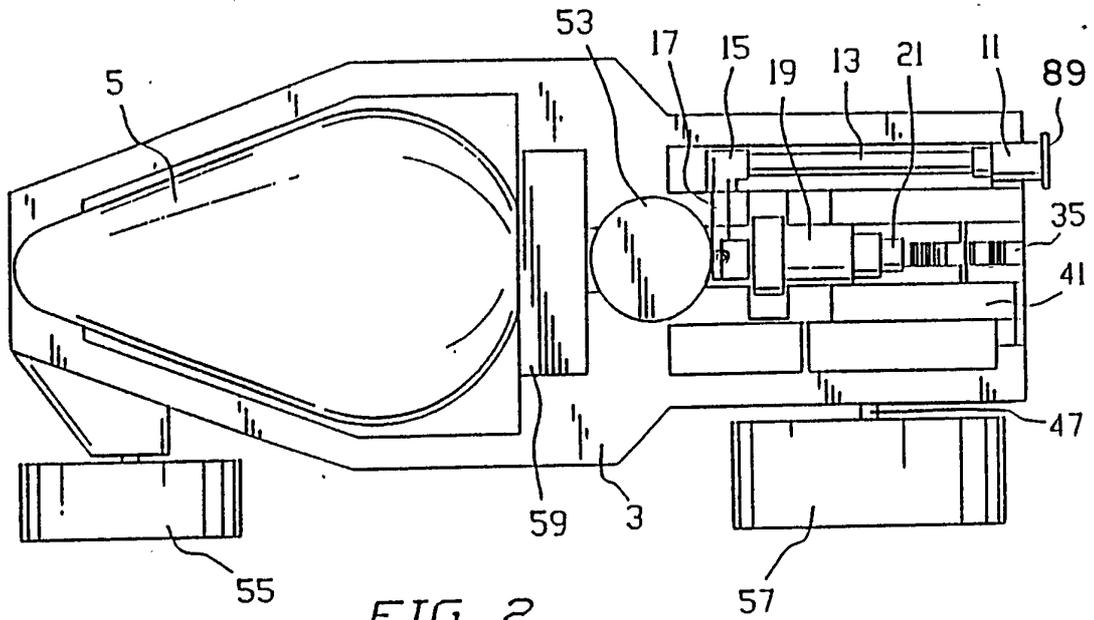
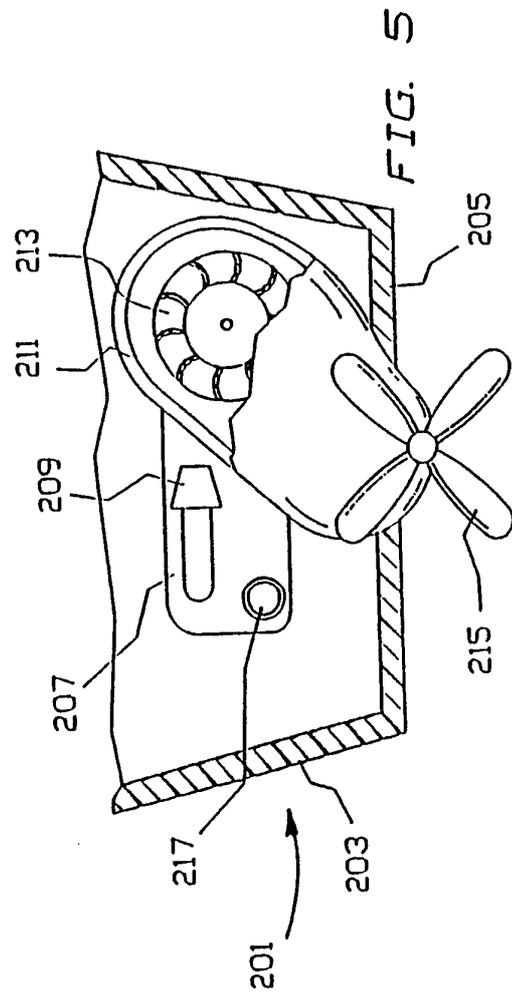
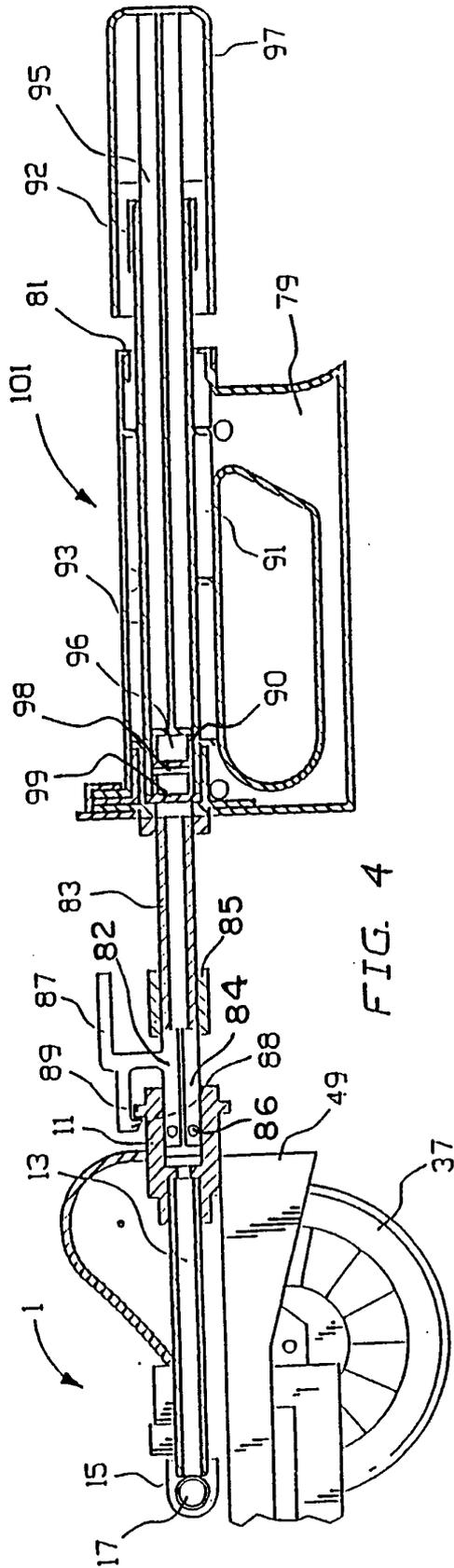


FIG. 1





INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/07653

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : A63H 29/16
US CL : 446/180, 165

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. : 446/180, 165, 176, 186, 211, 164, 163

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 3,613,303 (ALLEN) October 1971. See the entire document.	1-12
Y	US, A, 3,740,896 (GLASS ET AL.) June 1973. See the entire document.	1-12
Y	US, A, 4,159,705 (JACOBY) July 1979. See Figs. 2-4 and column 3, lines 13-49.	11, 12
A	US, A, 4,329,806 (AKIYAMA ET AL.) May 1982.	1-12

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

* Special categories of cited documents:	* 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
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