

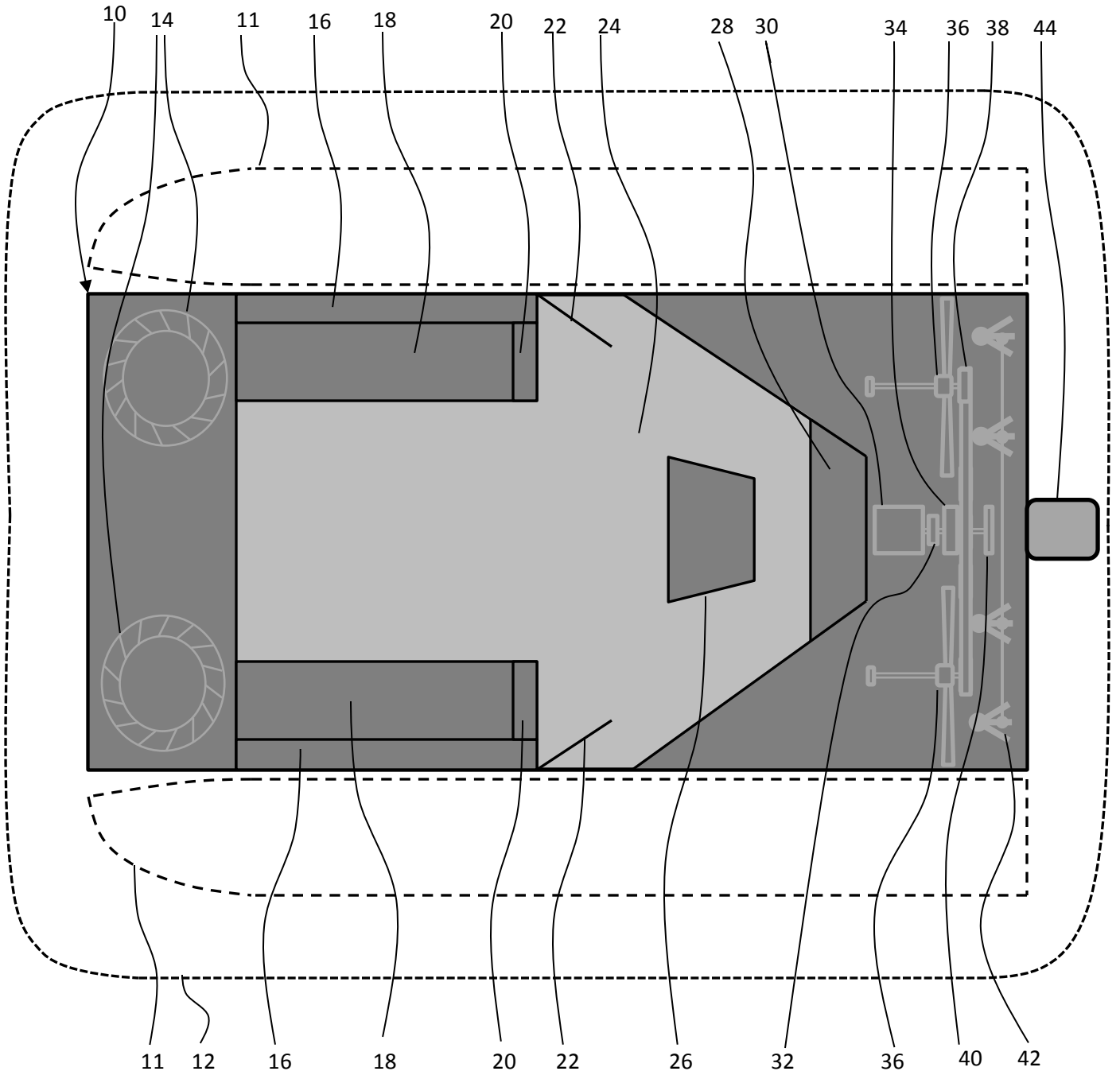
## Hovertoon Patent Abstract

The "Hovertoon" (patent# US 8,418,638 B2) is a hybrid of a hovercraft and pontoon boat. The function of which allows the operator to traverse over multiple water and land conditions. Most lakes and rivers either have shallow areas or have many sandbars which prevent conventional inboard/outboard water craft from traversing the shallow areas. This invention allows a pontoon boat to be transformed into a hovercraft that can maneuver over these shallow or no water conditions and yet transform back into a pontoon craft for navigable water conditions. The essence of this invention consists of pontoons that rotate outward, which increases the surface area of the hovercraft, thus providing more lift for increased load carrying capacity and more stability with a lower profile. The design incorporates ducted fan propulsion with side inlets. The lift fans are of standard squirrel cage design and incorporate front inlets. The side inlet design for the ducted fan propulsion allows for an open pontoon craft layout with a canvas convertible top and standard pontoon furniture components. The power plant, consisting of a V6 or V8 engine, is coupled to a hydraulic pump for the lift fans or outdrive unit and forward/reverse transmission which drives the ducted fans. The hydraulic pump powers the lift fans in hovercraft mode and also powers the outdrive unit when in pontoon mode. The forward/reverse transmission powers the ducted fans via a belt drive arrangement. And an electric brake system stops the ducted fans while shifting from forward to reverse.

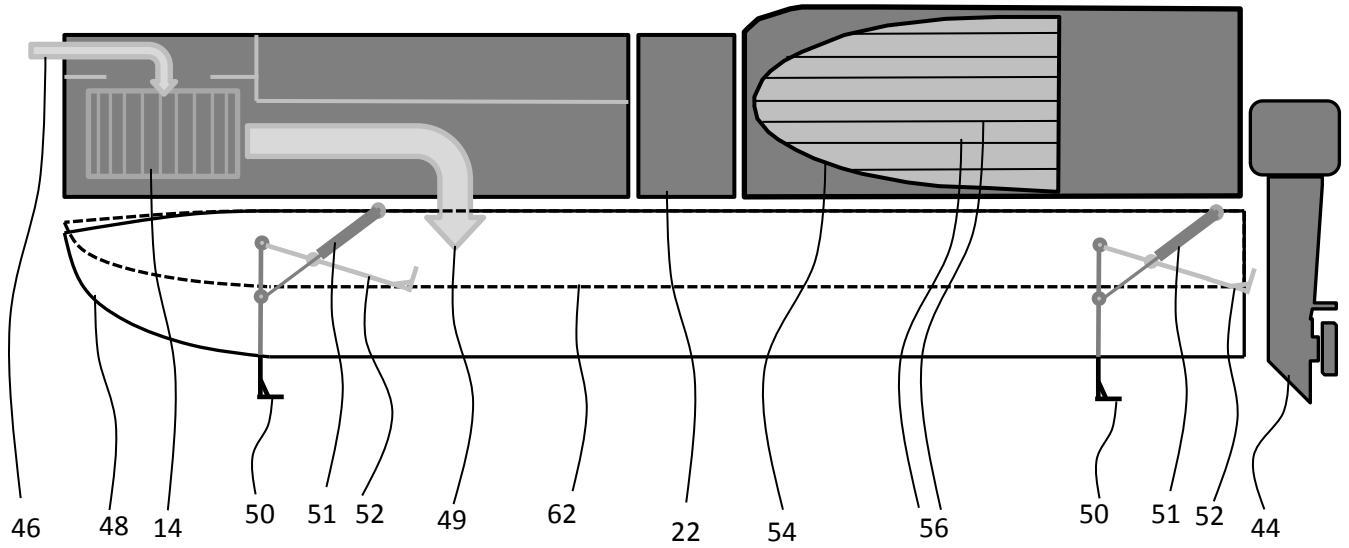
In order to shift from pontoon mode to hovercraft mode, hydraulic actuators are used to rotate the pontoons. A skirt retraction system pulls the hovercraft skirt to the underside of the pontoons while in pontoon mode or for transport on a trailer. The hydraulic pontoon actuators can also be independently controlled to provide for load leveling capabilities.

Lift fans inlets, and the propulsion fan inlets and outlets are protected with a horizontal metal bars to prevent ingestion of foreign matter and the rudders are also concealed behind the same metal bars for protection. Individual propulsion inlet rudders are used to direct reverse thrust that enables the craft to turn in confined spaces. The steering wheel provides steerage for both the rudders and the hydraulic outboard. A single forward/revers/throttle lever controls both the propulsion fan system and the hydraulic outboard.

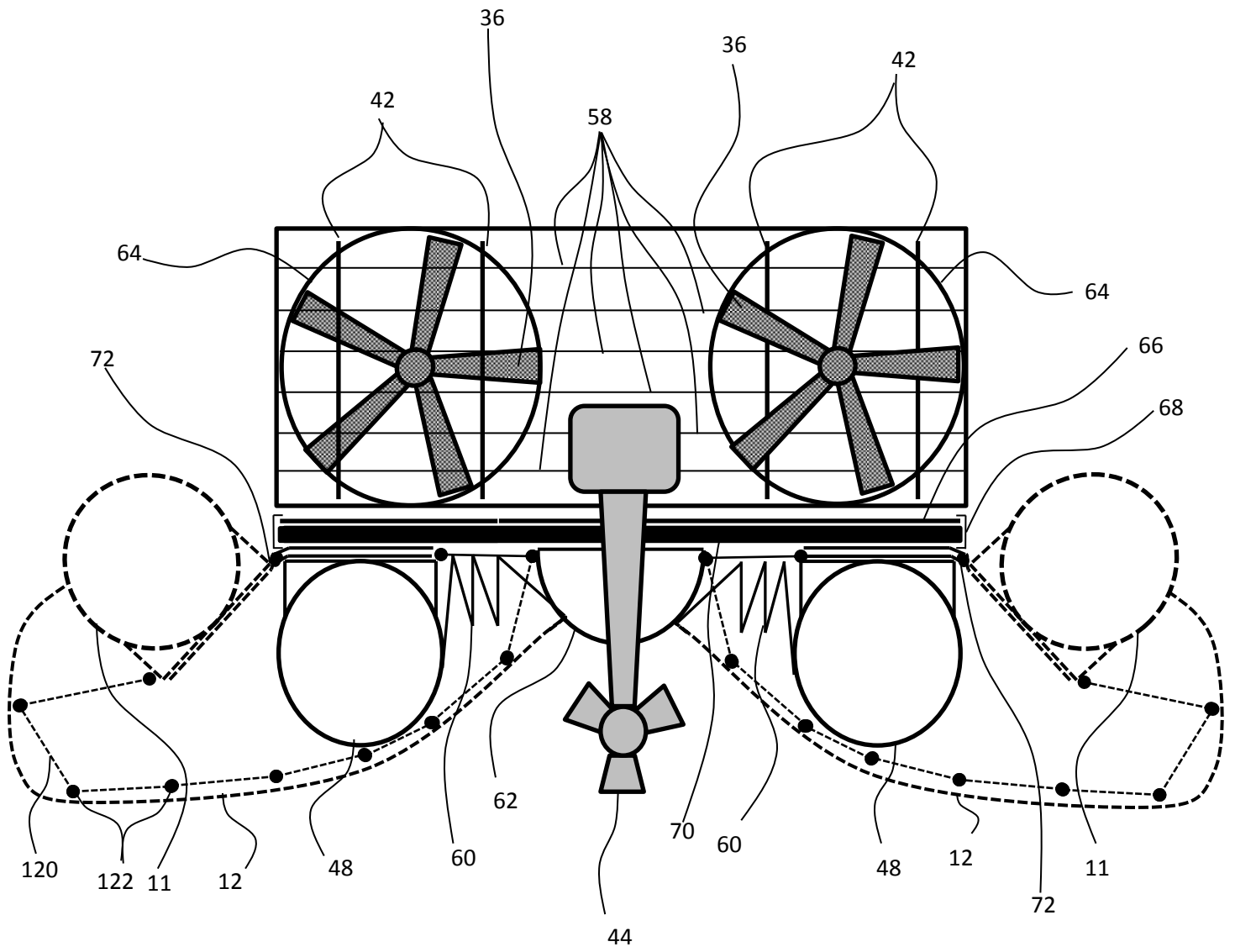
This craft has a self-contained cooling system using standard antifreeze that allows the craft to be used in the winter on snow, ice, and open water making it ideally suited for rescue operations. The inside of the craft can be outfitted with a canvas top/clear vinyl sides and interior heaters providing for year round use.



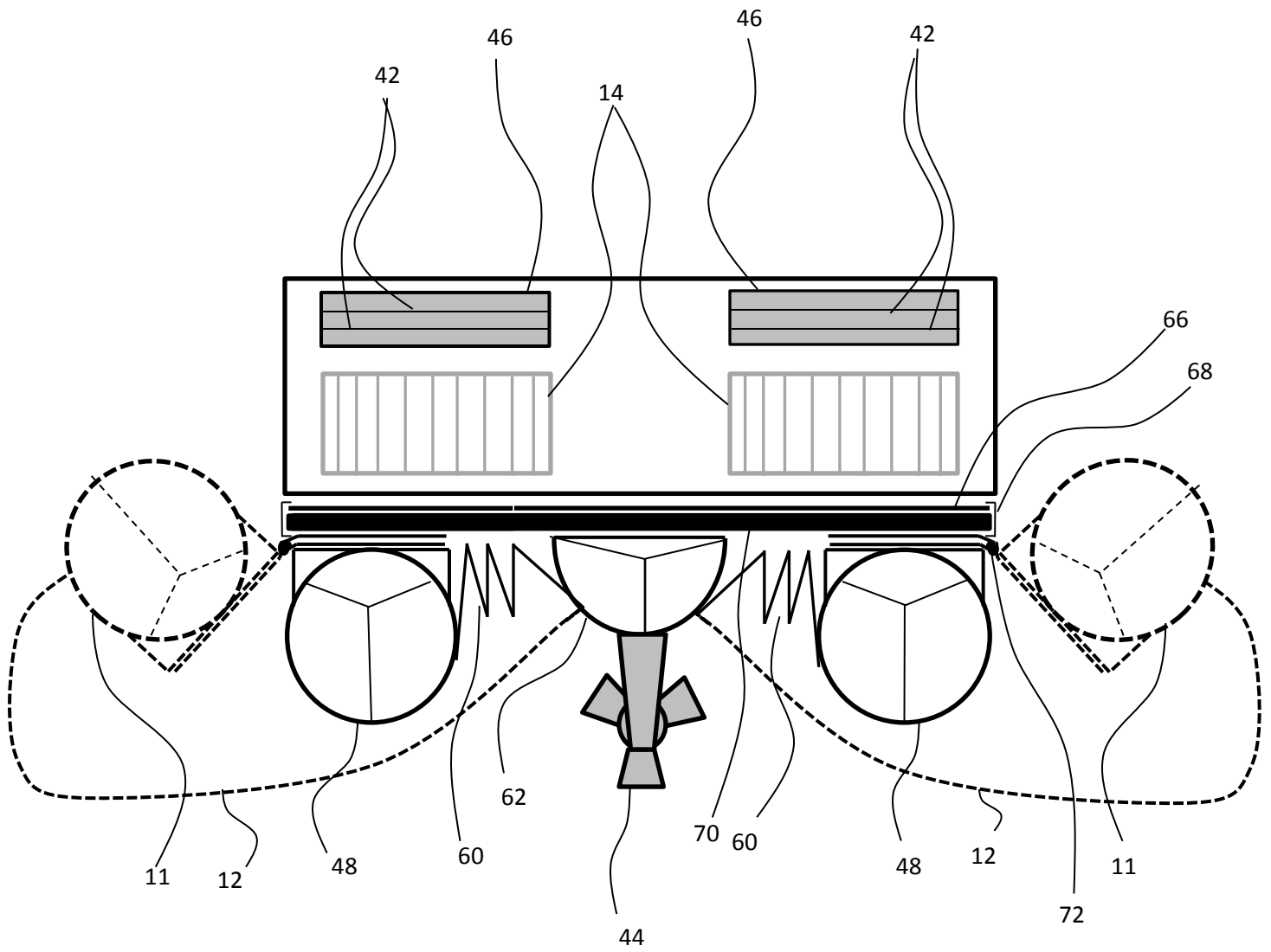
**Fig. 1**



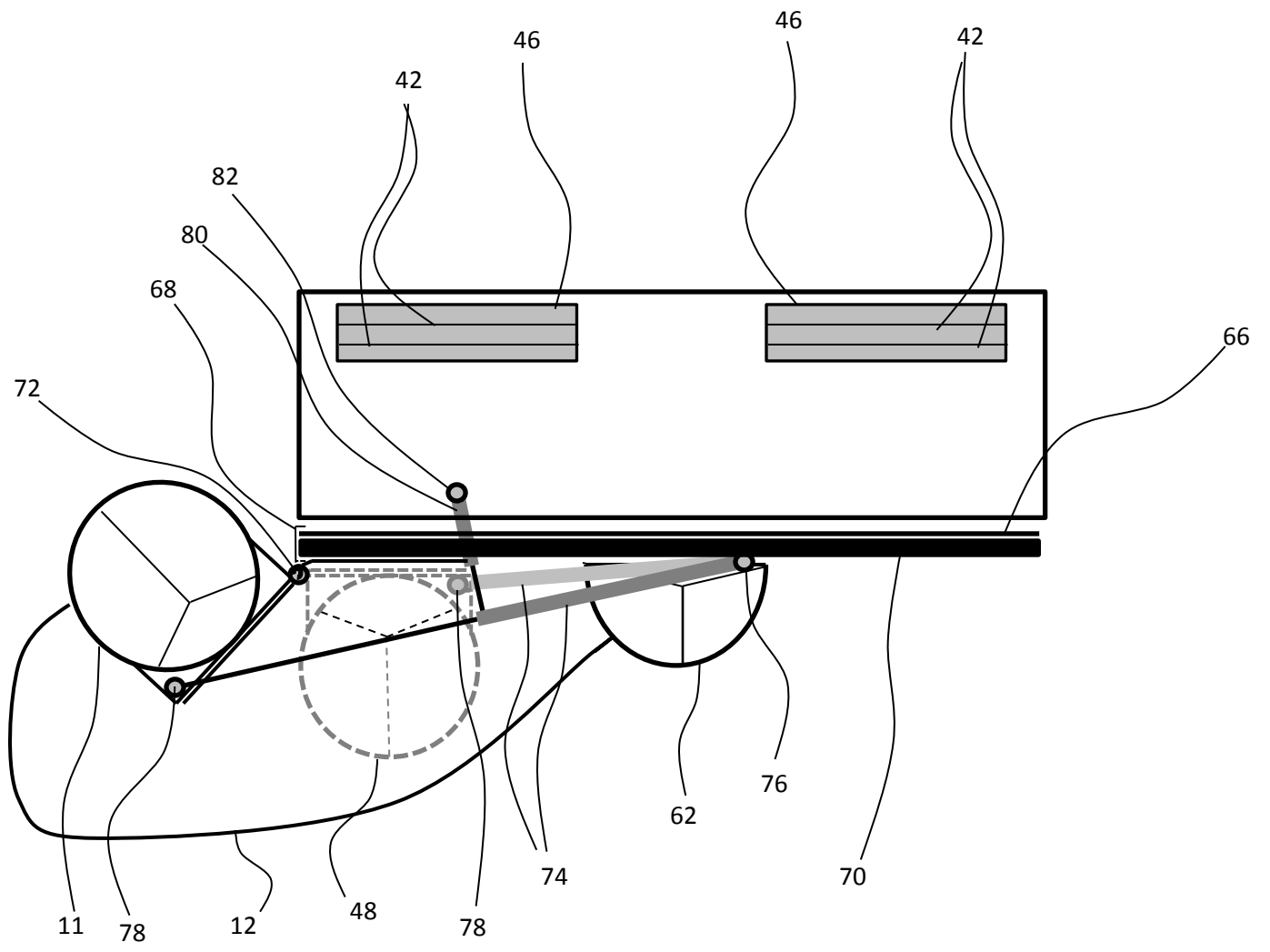
**Fig. 2**



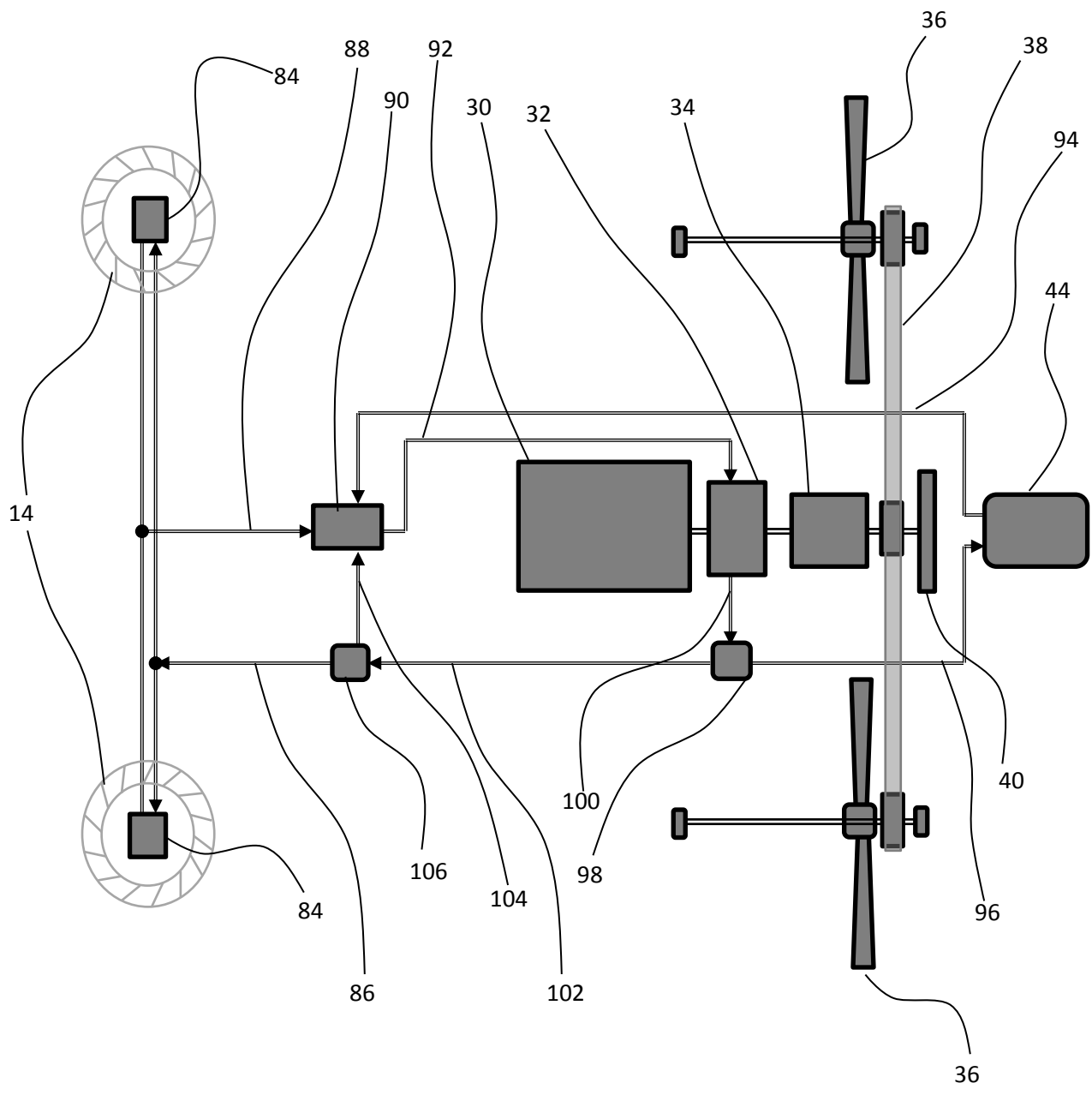
**Fig. 3**



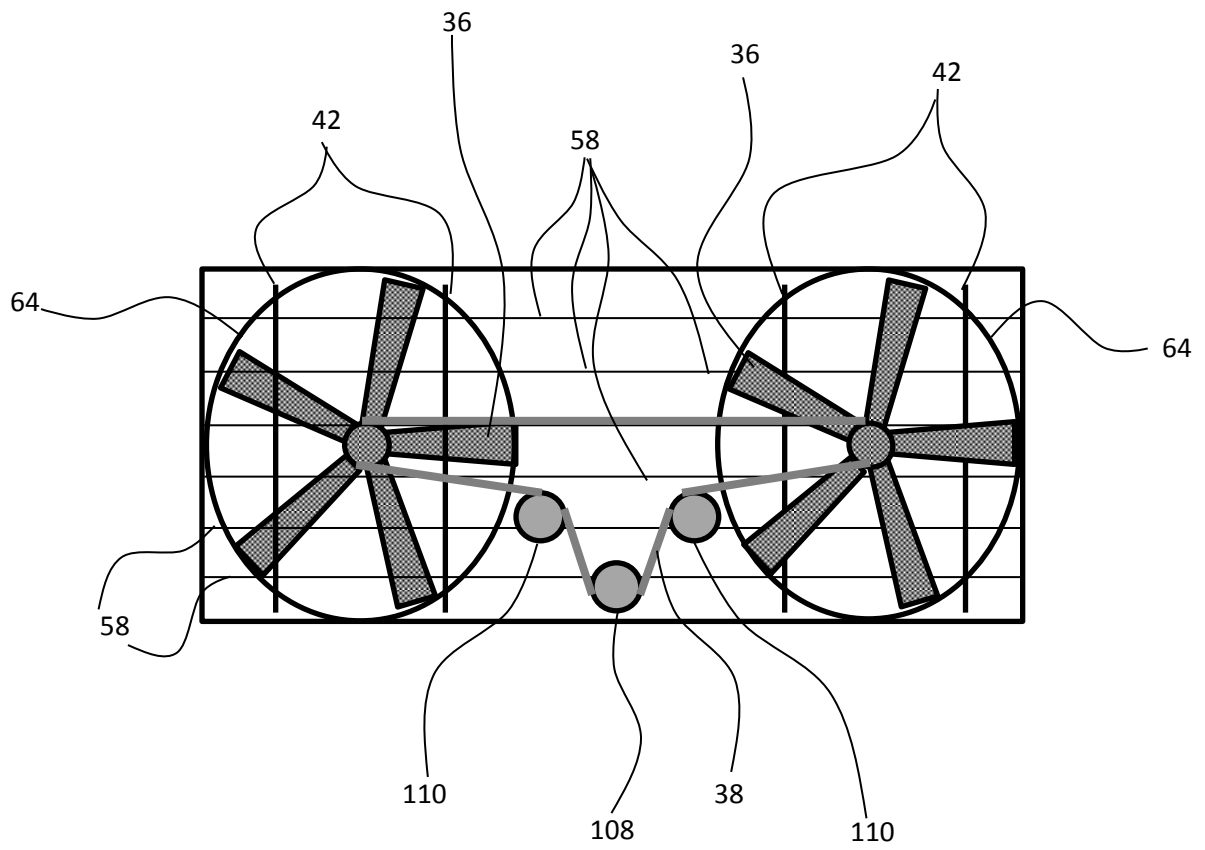
**Fig. 4**



**Fig. 5**

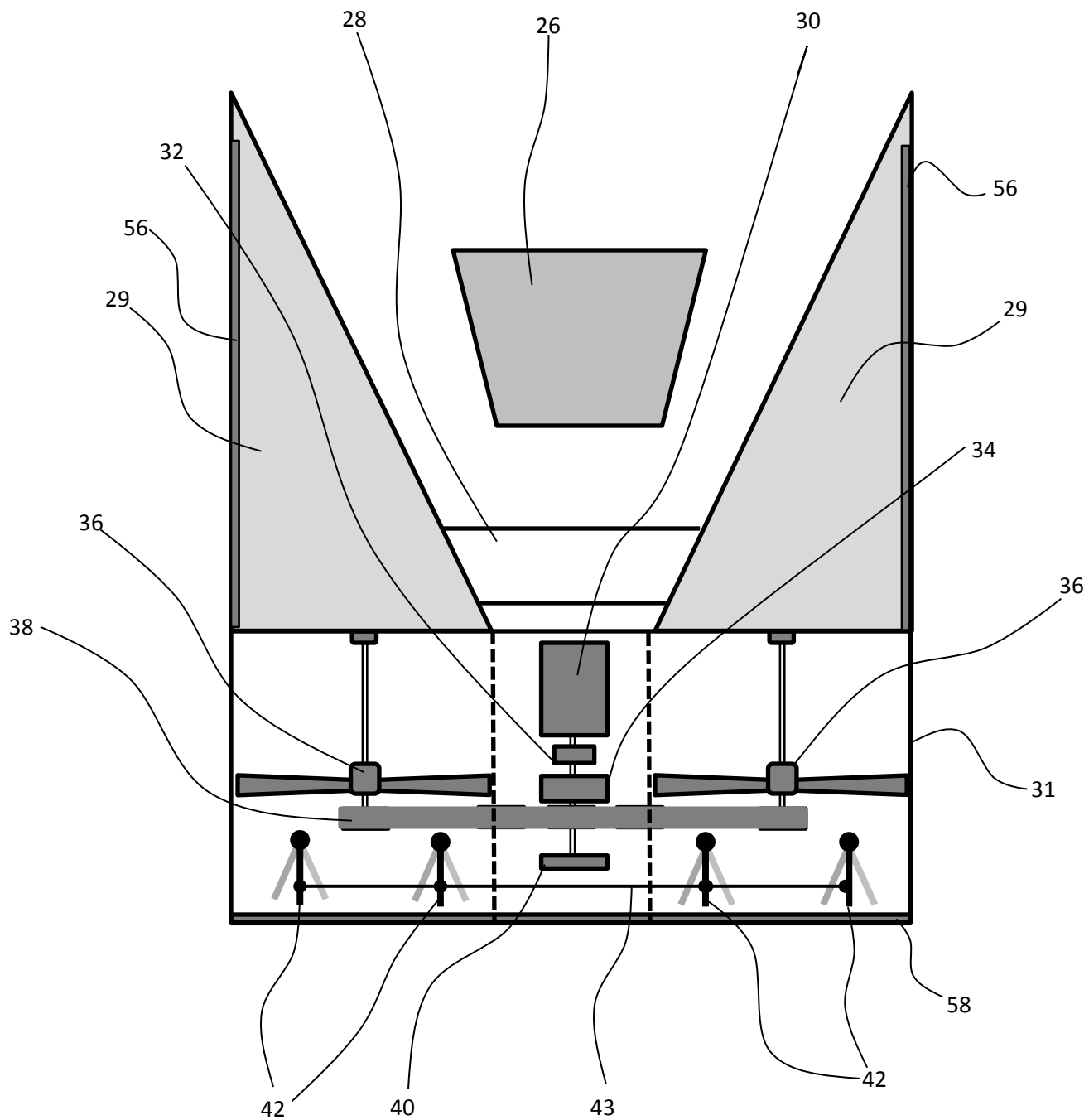


**Fig. 6**

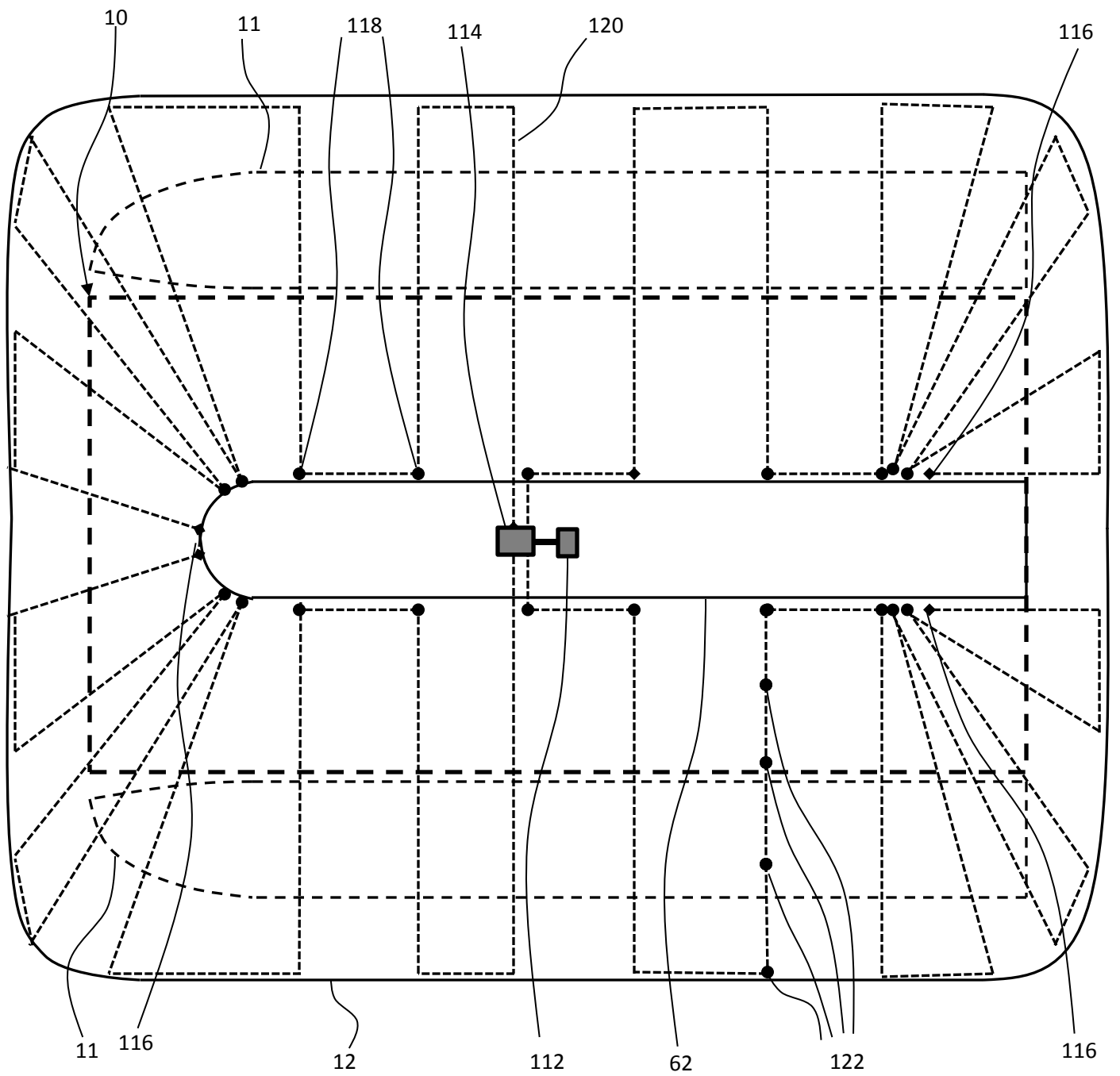


**Fig. 7**





**Fig. 8**



**Fig. 9**

## IN THE DRAWINGS

Fig. 1 is a top view of the craft showing the placement of the interior squirrel cage fans used for lift, the location of the motor and drive train, the propulsion ducted fans, hydraulic outboard used in pontoon mode, and the dashed lines showing the deployed pontoons and skirt for use in hovercraft mode.

Fig. 2 is a side view of the craft showing the pontoons retracted for pontoon mode and a dashed line showing the center half pontoon that houses the plumbing for hydraulics to the squirrel cage lift fans located in the front of the craft as well as the air flow. The side inlet design for the propulsion fans and deck access doors are shown. Landing gear for loading and unloading onto a cradle type pontoon trailer are shown attached to the center section of the craft.

Fig. 3 is a rear view of the craft showing the two propulsion ducted fans located behind a set of horizontal guard members. Four rudders are located between the fans and horizontal guard members. This figure shows the two and a half tub design and the retracted skirt. The dashed lines show the pontoons that are rotated 135 degrees and the deployed skirt in hovercraft mode and the skirt retraction cable.

Fig. 4 is a front view of the craft showing the internal placement of the squirrel cage lift fans and the front air inlets with horizontal guard members. As in Fig. 3, the dashed lines represent the pontoons deployed 135 degrees in hovercraft mode.

Fig. 5 shows the dual hydraulic ram system for deploying pontoon 135 degrees. Here the dashed lines and lightly shaded hydraulic ram shows the tub in pontoon mode. A total of four or six of the dual ram systems would be used depending on the length of the craft.

Fig. 6 is a mechanical schematic of the hydraulics used for the lift fans and outboard with associated valves and pressure regulator. The motor, lift pump, propulsion transmission, drive belt, and forward/reverse fan brake are also shown.

Fig. 7 shows the fan drive belt, idler pulleys and main drive pulley.

Fig. 8 is a diagram of the bolt on ducted fan module with side inlets, dual ducted fans, four rudders, protective horizontal inlet/exhaust guard members, and the location of the motor/pump/transmission.

Fig. 9 is a diagram of the skirt retraction system that uses an electric winch and cables threaded through eyelets in the skirt and fixed to the center half tube.

## DESCRIPTION OF THE ILLUSTRATIVE PREFERRED EMBODIMENT

The Hovertoon craft shown in the accompanying drawings is a versatile craft for year round use on water, ice, or land for recreational, emergency, or freight hauling applications. The Hovertoon is made up of a standard pontoon frame **10** utilizing aluminum cross members **70**, carpeted plywood deck **66**, and trimmed with U-channel **68**. On the front of the craft dual squirrel cage lift fans **14** are mounted that provide the airflow **46** necessary to inflate the retracted skirt **60** when the pontoons **48** are in the hovercraft pontoon mode **11** with a deployed skirt **12**. The pontoons are rotated 135 degrees outward from pontoon mode to hovercraft mode via a hinge **72** and a long hydraulic ram **74** and an assist hydraulic ram **80**. The long pontoon deployment rams are connected to the pontoon **11/48** and pivot at point **78** and on the bottom of the deck at pivot point **76**. The assist hydraulic ram **80** is connected to the deck of the craft at pivot point **82** and to the ram entry point of the long hydraulic ram casing **74**. There are two sets of hydraulic landing gear **50** that are used for loading and unloading of the craft from a standard cradle type pontoon trailer while on dry land.

The lounge seat **18** and back rest **16** provide air ducting **49** from the lift fans **14** to the underside of the deck **24**. The inlet air ports **46** for the squirrel cage fans **14** are protected by horizontal bars **42** spaced appropriately to avoid ingestion of foreign matter. Access to the deck **24** is via dual doors **22**. The pilot counsel **26** contains all the instruments and steering controls. The driver's seat **28** is integrated into the bolt on power assembly **31**. The power assembly contains the V6 or V8 motor **30** which is coupled to a hydraulic pump **32** and forward/reverse transmission **34** which drives the dual ducted fans **36** via a main drive pulley **108** using a drive belt **38** held taught by two idler pulleys **110**. The ducted fans **36** that are used for propulsion blow across the rudder assembly **42** that is directly coupled with the outdrive unit **44** allowing one steering mechanism to control both modes of operation. The propulsion side ducts **54** are mounted on the sides of the craft and are protected with horizontal bars **56** appropriately spaced to avoid ingestion of foreign matter. The propulsion fans **36** have circular ducts **64** to increase power and to contain any fan parts in case of breakage. The rudder assembly **42** is protected behind the horizontal bars **58** that also provide protection from foreign matter when the propulsion fans **36** are in reverse. A brake **40** is provided that stops the propulsion fans **36** when transitioning from forward to reverse and from reverse to forward.

Power for the craft comes from a single V6 or V8 motor **30** that directly drives a hydraulic pump **32** that provides pressure for either the two hydraulic lift fan motors **84** when in hovercraft mode or the hydraulic outboard **44** when in pontoon mode. Switching hydraulic power between the lift fan motors **84** via pressure line **102** and the outboard **44** via pressure line **96** is accomplished via mode valve **98** that is fed from pressure line **100** connected to the output of hydraulic pump **32**. The speed of the lift fan hydraulic motors **84** which are fed from pressure line **86** at the output of the hydraulic pressure regulator **106** fed from pressure line **102** are limited to a low fixed speed. The bypass hydraulic fluid from regulator valve **106** returns to the reservoir **90** via the return line **102**. Return line **88** from the lift

fan motors **84** and return line **94** from the hydraulic outboard **44** are fed to the filter reservoir **90**. The hydraulic fluid is fed from the reservoir **90** to the hydraulic pump via a feed line **92**. Coupled to the hydraulic pump **32** is a forward/reverse transmission **34** which supplies power to the propulsion fans **36** via a drive pulley **108** with tension on the drive belt **38** provided by two idler pulleys **110**. Both the lift fan assembly **14**, propulsion/rudder assembly **31**, pilot console **26**, pilot seat **28**, side propulsion ducts **29** are designed to be standard across various length craft. Use of a V6 or V8 motor **30** would be determined by the length of the craft and load carrying requirements.

When on dry land, unloading of the craft would be accomplished by winching the craft backwards until the rear landing gear **50** is fully extended and then winched further until the front landing gear **50** can be extended, then the cradle pontoon trailer can be driven away. The two main pontoons **48** which are not touching the ground can be extended via pontoon extension hydraulic rams **74** and **80**. Once the pontoons **11** are in hover mode, power can be applied to the lift fans **14** and the skirt **12** allowed to be deployed and float the craft, at which time the front and rear landing gear **50** can be retracted. If backing the Hovertoon **10** into water in pontoon mode **48**, the hydraulic outboard **44** can be used to back the craft off the trailer and be used as a pontoon boat or deploy the pontoons **11** to hover mode and shift valve **98** to hover mode to power the lift fans motors **84** to hover the craft on the water. Once hovering, power can be applied to the propulsion fans **36**.

When loading the Hovertoon **10** on a cradle trailer from water, the pontoons **48** will need to be in pontoon mode and the craft can either be winched onto the trailer or the hydraulic outboard **44** can be used to push the craft onto the trailer. If the craft is driven onto land, the landing gear **50** is deployed, the lift fans **14** disengaged, deployed pontoons **11** retracted to pontoon position **48**. The trailer can then be backed under the craft, when the front of the pontoons **48** are on the cradle, the front landing gear **50** can be retracted and the trailer pulled up to the rear landing gear **50**, at which time the rear landing gear **50** can be retracted and the craft winched the rest of the way onto the trailer.

Standard canvas Bimini tops can be used to cover various parts of the deck **24** since the design is based on front side lift fan inlets **46** and side propulsion inlets **56** and rear side propulsion outlets with protective horizontal bars **58**.

The skirt **12** is retracted via cable **120** and wound onto spool **114** powered by an electric motor **112** where the cable **120** is threaded through eyelets **122** that are sewn into the skirt's **12** seam. An electric motor **112** powers a spool **114** that retracts the skirt **12** via a system of pulleys **118** mounted to the center half tube **62**, the top inside of outer tubes **48** and the bottom of the deck **24**. To deploy the skirt **12**, the skirt **12** is inflated via the lift fans **14** at the same time the electric motor **112** unwinds the cable **120** from the spool **114**.