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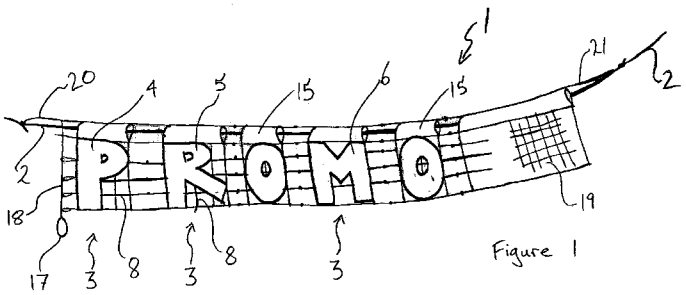


Figure 1

(57) Abstract: Arrangements, systems, methods and aerodynamic forms are described. Some embodiments may be particularly suited to flying kites from vehicles, to flying large kites and to flying kites and banners, for example at events or kite festivals. Launch, retrieval, display, steering and safety arrangements are provided.

KITES AND OTHER AERODYNAMIC FORMS, METHODS, SYSTEMS AND ACCESSORIES RELATING TO KITES AND OTHER AERODYNAMIC FORMS

FIELD OF THE INVENTION

The invention relates generally to the field of launching, flying, steering and retrieval of aerodynamic forms, particularly but not exclusively to launching, flying, steering and retrieval of kites.

It is an object of the invention to provide improved kites or other aerodynamic forms, systems and methods associated with kites or other aerodynamic forms and/or accessories for kites or other aerodynamic forms, or at least to provide the public with a useful choice.

SUMMARY OF THE INVENTION

In a first aspect the invention provides a sky-launch kite system including: a kite; a flying line attached to the kite; a kite container configured to hold the kite and having an opening closed by a closure; and a release mechanism for controlled remote release of the closure after the kite container has been raised into the air; wherein, in use, the kite contained in the kite container can be raised into the air using a pilot lifter, and the closure can be released by a remotely positioned user using the release mechanism, thereby releasing the kite from the kite container.

Preferably the release mechanism includes an engagement element which can be released by pulling on the engagement element with a release line to which it is attached.

Preferably the release line or engagement element is also attached to the kite container to facilitate retrieval of the kite container after release of the kite.

Preferably the kite container is a kite bag.

Preferably the system includes a plurality of bridle lines connecting the kite to the flying line and arranged around an opening of the kite so as to keep the opening to the wind after the kite has been released from the kite container so as to promote ram air inflation of the kite.

Preferably the pilot lifter is a pilot kite. In this specification the term "pilot lifter" includes any lifter that is used to lift, partially lift and/or stabilise a kite or decorative "line junk". "Pilot kite" has a corresponding meaning.

Several kite containers each containing a kite may be raised using a single pilot lifter. In this case, the kites are preferably attached to a single flying line. Alternatively, each kite may have a separate flying line.

Preferably bridle lines connect the kite to a flying line and are kept substantially outside the kite container.

Preferably the container is lifted by a pilot lifter.

Alternatively the container may be lifted by or onto one or more launch members.

This first aspect also extends to a method of launching a kite including: raising a kite container containing a kite into the air using a pilot lifter; and releasing the kite from the container.

This first aspect also extends to a sky-launch kite container having a closure including a release mechanism enabling controlled remote release of the closure after the kite container has been raised into the air, thereby releasing a kite contained in the kite container.

In a second aspect the invention provides a launching skirt configured for attachment to the stern of a boat such that, in use, the leading edge of the skirt is maintained above the surface of the water, such that the skirt sits on the surface of the water behind the boat, allowing an inflatable aerodynamic form to be launched from the skirt without taking on sufficient water to prevent successful launch.

Preferably the skirt is configured for attachment to a boom wider than the boat.

In a third aspect the invention provides a steerable kite including: an aerodynamic form; a plurality of bridle lines for connecting the aerodynamic form to a flying line, the bridle lines including one or more steering lines; and a steering module; wherein the steering module is configured to be connected to the flying line and to ride over one or more steering bridle lines, each steering bridle line being connected to the aerodynamic form at two or more connection points.

Preferably the steering module is configured to return to a neutral balance point in the event of failure or a determination that failure is imminent.

Preferably the failure is a failure in the steering module, a controller arranged to communicate with the steering module or in a communication link between the steering module and the controller.

Preferably the steering module is configured to release its grip so as to ride freely over the steering bridle line or lines to the neutral balance point in the event of failure or a determination that failure is imminent.

Preferably the steering module is configured to release one or more bridle lines as a safety mechanism.

Preferably at least some of the lines to be released are at or near the kite's leading edge.

Preferably the steering module is configured to receive control signals from a remote controller. Preferably the steering module is configured to communicate over a wireless link with the remote controller.

The kite system may act as a pilot kite for one or more other kites.

In a fourth aspect the invention provides a steerable kite including: an aerodynamic form,

a plurality of bridle lines for connecting the aerodynamic form to a flying line, the bridle lines including one or more steering lines; and a steering module; wherein the steering module is configured to be connected to the flying line and at least one of the steering lines and is configured to return to a neutral balance point in the event of failure or a determination that failure is imminent.

Preferably the failure is a failure in the steering module, a controller arranged to communicate with the steering module or in a communication link between the steering module and the controller.

Preferably the steering module is programmed to return to the neutral balance point in the event of failure or a determination that failure is imminent.

Preferably the steering module is configured to release one or more bridle lines as a safety mechanism. Preferably at least some of the lines to be released are at or near the kite's leading edge.

Preferably the steering module is configured to receive control signals from a remote controller. Preferably the steering module is configured to communicate over a wireless link with the remote controller.

The kite system may act as a pilot kite for one or more other kites.

In a fifth aspect the invention provides a user-configurable banner system for mounting to a flying line, including: a plurality of individual flexible display components, wherein a desired banner can be formed by joining selected individual display components to each other and wherein at least some of the individual display components are configured for attachment at their top edges to a flying line; and a weight configured for attachment to the bottom of the leading edge of the banner.

Preferably each individual flexible display component includes a flexible grid and a display element connected to the flexible grid.

Preferably the display elements include one or more of: letters, numerals, graphical elements, logos, symbols, sign and insignia.

Preferably selected individual display components are joined to each other by joining their respective flexible grids to each other.

Preferably the flexible grids are formed from cord, tape or line.

Preferably the flying line is a kite flying line.

Preferably the banner system is free of rigid structural elements.

Preferably at least some of the individual flexible display components include loops along their top edges through which the flying line passes.

Preferably attachment means are provided for attaching the banner to the flying line at its leading and trailing edges.

This fifth aspect also extends to a display system including a banner system as described above attached to a flying line having an average angle to the horizontal in the range 20 to 60 degrees.

In a sixth aspect the invention provides an attachment system for attaching an aerodynamic form to a surface vehicle, including: a V-line connected at two points to the vehicle, the length of the V-line being greater than the shortest distance between the two points; a slider riding on the V-line; and a securing mechanism connected to the slider and configured to attach to a flying line connected to the aerodynamic form.

Preferably the slider is a pulley.

The attachment system is particularly beneficial when used with a boat or ship.

In a seventh aspect the invention provides a ram air inflated kite having a bridle set consisting of five or less bridle lines positioned at or near the kite's leading edge and configured to connect the kite to a flying line.

In an eighth aspect the invention provide an inflatable aerodynamic form including: top and bottom skins at least partly defining a ram air inflatable volume; an opening at or near a leading edge of the form, opening into the ram air inflatable volume; and a valve including a flexible valve wall defining a substantially tubular flow passage, the flexible wall being attached to the top skin and being configured to deform to close the flow passage when the pressure in the ram air inflatable volume is greater than the pressure at the opening.

Preferably the flow passage, when open, has a cross-sectional area which decreases towards a trailing edge of the form.

Preferably the flexible wall is attached to the top skin substantially along its length.

In a ninth aspect the invention provides a modifiable aerodynamic form having a shape for interacting with a fluid moving relative to the aerodynamic form, the shape of the aerodynamic form being defined at least in part by one or more flexible skins; the aerodynamic form including one or more dynamically controllable valves for controlling ingress of fluid to and/or egress of fluid from a modifiable chamber so as to control a pressure difference or differences between the internal pressure of the modifiable chamber and a pressure or pressures external to the modifiable chamber so as to modify the shape of the modifiable chamber and thereby to modify the shape of the aerodynamic form.

Preferably the form can be steered through operation of the dynamically controllable valves and resulting modification of the shape of the aerodynamic form.

Modification of the shape of the modifiable chamber may result in a modification of the chordwise shape of the aerodynamic form over at least part of its span.

Preferably the modifiable aerodynamic form is a kite. Preferably the kite is a ram-air inflated kite.

Alternatively the kite may be a substantially single skin kite.

Preferably the modifiable aerodynamic form is an inflated form. Preferably the inflated form is a kite, parachute, parafoil, or paraglider. Preferably the inflated form is a ram-air inflated form.

Preferably the modifiable chamber is a ram-air inflated chamber.

The modifiable aerodynamic form may include a pump for inflating the modifiable chamber.

The modifiable aerodynamic form may include a pump for supplementing ram-air inflation of the modifiable chamber.

Preferably the pump is a powered fan.

Preferably the controllable valves include one or more of: butterfly valves, slide valves, controllable flaps, irises or draw cords.

Preferably the modifiable aerodynamic form includes one or more actuators configured to receive control instructions from a controller and to operate the dynamically controllable valves.

Preferably the actuator is configured to receive control instructions over a wireless communications link.

In a further aspect the invention provides a launch arrangement for launching an aerodynamic form from a surface vehicle, including: one or more launch members; one or more attachment points on the one or more launch members configured to attach to one or more points of the aerodynamic form or bridle lines adjacent the aerodynamic form; and a controllable release arrangement configured to controllably release the aerodynamic form or bridle lines from the attachment points for launching; the one or more launch members being configured to move between a retracted position in which a crew member of the surface vehicle can reach the attachment points in order to attach the aerodynamic form thereto and an extended launch position.

Preferably each launch member is an elongate bar pivotally mounted to the surface vehicle to rotate between the retracted and extended positions.

Preferably the attachment points are positioned adjacent ends of the elongate bars and those ends are further apart in the extended position than in the retracted position.

Preferably the launch members extend in the extended position generally upwards and backwards from the surface vehicle.

Preferably the bars are curved towards the horizontal towards their distal ends, when viewed in the extended position.

Preferably the arrangement includes two launch members, one on either side of the surface vehicle.

Preferably the launch members extend generally forwards in the retracted position.

Preferably the controllable release arrangement includes a remote release actuator allowing a user to actuate the release arrangement.

Preferably the arrangement includes a container configured to contain the aerodynamic form while it is attached to the one or more launch members, and a further release arrangement for release of the aerodynamic form from the container.

Preferably the surface vehicle is a jetski, personal watercraft, four wheel motorbike or ski-mobile.

In a further aspect the invention provides an attachment system for attaching an aerodynamic form to a surface vehicle, including: a winch having an inherent first axis of rotation and rotatably mounted to the surface vehicle so as to rotate about a second axis substantially transverse to the first axis.

Preferably the system includes a motor for driving the winch. Preferably the motor is a hydraulic motor. Preferably the hydraulic motor is positioned inside a shaft of the winch.

Preferably the system is configured for line to unwind from the winch under its own tension, the system including a control mechanism connected to the hydraulic motor for controlling the speed of rotation of the winch while unwinding.

Preferably the system includes a fairlead mounted with or to the winch so as to rotate with the winch about the second axis. Preferably the fairlead also rotates about a third axis transverse to the second axis. Preferably the third axis is the same as the first axis. Preferably the third axis is substantially horizontal and the fairlead is biased towards a vertical orientation.

Preferably the surface vehicle is a jetski, personal watercraft, four wheel motorbike or ski-mobile.

Preferably the winch includes a replaceable drum.

Preferably the system is configured for winding and unwinding of a line, wherein one or more aerodynamic forms and/or decorative or display components are wound onto and unwound from a winch drum together with the line.

In a further aspect the invention provides an aerodynamic form safety or control system, including a control arrangement and a release mechanism, wherein the control arrangement is configured to control activation of the release mechanism to release or sever one or more lines included in or connected to the aerodynamic form.

Preferably the control arrangement includes a controller configured to communicate over a wireless link with the release mechanism.

Preferably the controller is configured to be worn by a user and includes an actuator for user-actuation of the controller.

Preferably the controller is waterproof.

Preferably the control arrangement includes a sensor, the control arrangement being configured to activate the release mechanism in response to information from the sensor.

Preferably the release mechanism includes a component for producing heat so as to cause failure of a heat sensitive component.

Preferably the component for producing heat is a resistive wire, configured to burn through one or more lines included in or connected to the aerodynamic form.

Alternatively the heat sensitive component is a wax component.

Preferably the release mechanism includes a mechanical release element.

Preferably the release mechanism includes an electric power source and a switch.

Preferably the system includes a retrieval line which connects the aerodynamic form to a flying line after the one or more lines have been released or severed.

In a further aspect the invention provides a banner system for mounting to a flying line, including:
a banner attached to a flying line;
a primary lifter connected to the flying line; and
an auxiliary lifter on an auxiliary line, the auxiliary line being connected to the banner or to the flying line at or near the banner.

Preferably the primary and auxiliary lifters are kites.

Preferably the auxiliary lifter is connected at or near the leading edge of the banner.

Preferably the auxiliary lifter flies above the banner and flying line.

In a further aspect the invention provides an inflatable single line kite including one or more skins defining an inflatable volume and one or more openings or valves remote from a leading edge of the kite and configured to allow flow of air from the inflatable volume to the outside of the kite when pressure in the inflatable volume exceeds a threshold.

In a further aspect the invention provides a kite system, including: an inflatable kite having one or more openings or valves remote from its leading edge such that air flows from an inflatable volume of the kite to the outside of the kite when pressure in the inflatable volume exceeds a threshold; a flying line attached to the kite; a winch onto which the flying line can be wound to retrieve the kite; a fairlead through which the flying line passes at least during retrieval; wherein, when the kite is retrieved by winding the flying line onto the winch, the kite passes through the fairlead, resulting in pressure in the inflatable volume exceeding the threshold and air flowing through the openings or valves to deflate the kite.

Preferably the kite can be wound onto the winch together with the flying line.

Preferably the valves are closed at normal operating pressures.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a banner system;

Figure 2 shows an individual display component from the banner system of Figure 1;

Figure 3 shows one method of joining display components in the banner system of Figure 1;

Figure 3A shows a further embodiment of banner system;

Figure 4 shows a system for launching a kite;

Figure 5 shows the system of Figure 4, as launching is commenced;

Figure 6 shows the system of Figure 4, part way through the launching process;

Figure 7 shows the system of Figure 4, following successful launch of a kite;

Figure 8 is a broader view showing how the system of Figure 4 may be deployed;

Figure 9 shows the leading edge region of a kite and a valve situated near the leading edge;

Figure 9A shows the valve of Figure 9;

Figure 10 shows a skirt attached to the stern of a boat;

Figure 11 shows an alternative form of skirt attached to a boat;

Figure 12 shows one method of connecting a flying line to a boat;

Figure 13 illustrates a V-line system for connecting a flying line to a boat;

Figure 14 shows in detail the connection between the flying line and V-line of Figure 13;

Figure 15 is a further view of the V-line system of Figure 13;

Figure 16 is yet a further view of the V-line system of Figure 13;

Figure 17 shows a steerable kite;

Figure 18 shows one embodiment of a steering module for the kite of Figure 17;

Figure 18A is a second view of the steering module of Figure 18;

Figure 19 shows an alternative embodiment of steering module for the kite of Figure 17

Figure 19A is a second view of the steering module of Figure 19;

Figure 20 is a schematic diagram of a steering module for the kite of Figure 17;

Figure 21 shows a kite with a modifiable chamber;

Figure 21A shows the kite of Figure 21, with its shape having been altered using the modifiable chamber;

Figure 22A shows a bridled parafoil kite in a neutral mode;

Figure 22B shows the kite of Figure 22A in a turning mode;

Figure 23A shows a further bridled parafoil kite in a neutral mode;

Figure 23B shows the kite of Figure 23A in a turning mode;

Figure 24 is a side view of a launch arrangement according to one embodiment mounted on a personal watercraft;

Figure 24A is a front view of the arrangement of Figure 24;

Figure 25 shows the arrangement of Figure 24 in a second position;

Figure 25A is a front view of the arrangement of Figure 25;

Figure 26 is a cross-section showing an attachment point from the arrangement of Figure 24, in an engaged position;

Figure 26A is a further cross-section showing the attachment point of Figure 26, in a release position;

Figure 27 shows a further embodiment of arrangement for flying an aerodynamic form from a vehicle;

Figure 27A is an enlarged view of a container used in the arrangement of Figure 27;

Figure 28 shows the arrangement of Figure 27, a kite having been released from the container;

Figure 29 shows the arrangement of Figure 27, the kite having been released from the launching members;

Figure 30 shows a further embodiment of banner system;

Figure 31 shows an aerodynamic form according to a further embodiment;

Figure 32 shows a valve in the form of Figure 31;

Figure 32A shows the valve of Figure 32 in an open position;

Figure 33 shows an alternative valve;

Figure 33A shows the valve of Figure 33 in an open position;

Figure 34 illustrates a safety or control arrangement according to a further embodiment;

Figure 35 is a schematic diagram of a controller used in the arrangement of Figure 34; and

Figure 36 is a schematic diagram of a release mechanism of the arrangement of Figure 34.

DETAILED DESCRIPTION

In the following description there is discussion of kite flying. Many of the methods and systems described are applicable to kite flying from surface vehicles, such as land vehicles or boats. It is possible to fly a kite from a vehicle in low wind by moving the vehicle forwards at a sufficient speed to provide an effective wind speed at the kite which is sufficient to provide lift and allow the kite to fly. It is even possible to move the vehicle with the wind, so long as the speed of the vehicle relative to the real wind speed is sufficiently high to provide sufficient effective wind speed at the kite. In this specification, the terms upwind, downwind, wind speed etc are to be understood to include such effective wind directions and speeds unless the context dictates otherwise.

Various methods and systems described below are suitable for, or designed specifically for, large show kites. These are kites weighing more than 4kg, often more than 10 kg, with the largest kites weighing around 20 to 30 kg.

Figures 1 to 3 show a user-configurable banner system 1. The banner system is configured to attach to a flying line 2. The flying line 2 may be a kite flying line, but could be a flying line for a blimp etc, so long as the flying line, in use, tends to extend upwards in a downwind direction. Preferably the flying line extends upwards at an average angle in the range 20 to 60 degrees to the horizontal.

The bottom of the flying line is attached to an anchor point which may be fixed or moving, and may be on the ground, a vehicle or marine craft.

The banner system includes a number of individual flexible display components 3. Each display component 3 includes a display element 4, 5, 6, which may be a letter, numeral, graphical element, logo or any other desired element. In the example shown, the display elements are letters spelling 'PROMO'. A display element may be custom made for a particular organisation (e.g. a logo), banner or occasion. However, the banner system may also be supplied in kit form such that a desired banner can be built up from ready made, standard display components. For example, a kit could include all the letters of the alphabet, with multiple components for the more commonly used letters, and three sets of numerals. This should be sufficient to allow most desired banners to be put together from the kit.

The length of the banner is limited only by the available length of flying line and the ability of the lifter (e.g. kite) to lift the banner.

A flexible display component 3 is shown in more detail in Figure 2. Each flexible display component 3 includes a flexible grid 8 to which the display element 4, 5, 6 is attached. The display elements may be attached by any suitable means, including sewing or gluing.

The flexible grid may be formed from suitable vertical lines, cords or tapes 10 and horizontal lines, cords or tapes 11 and the horizontal lines, cords or tapes 11 may be provided with attachment means at each end. In the example shown, the attachment means include a loop 12 which can be connected in conventional manner to a knot 13 formed in the right hand end of the corresponding line, cord or strap in an adjacent display component 3. This connection method is shown in detail in Figure 3. Various other connection methods will occur to the skilled person, including buttons/loops, snap locks, Velcro etc.

Thus, display components are connected together by connecting their flexible grids 8 together.

Each flexible display component 3 also includes at least one top loop or sleeve 15. In the example shown the top loop 15 is formed from fabric, but the loop could be formed from line, cord, tape or any other suitable material. The loops 15 engage with the flying line 2 as shown in Figure 1, maintaining the top edge of the banner along the flying line 2. It is also possible to attach the flexible grid of each display component directly to the flying line, rather than using loops or sleeves. However, the use of loops or sleeves along the banner's top edge makes it much easier and quicker to fit the banner to or remove the banner from a flying line.

The load and tension of the banner are taken along this top edge, with the display components 3 hanging below.

A weight 17 can be attached to the lower corner of the banner. This helps to keep the front edge 18 of the banner taut. Airflow over the banner then keeps the rest of the banner unfurled and in alignment. A mesh like fabric 19 can be attached at the upper trailing edge of the banner to assist with this alignment.

A further line or cord 20 may be used to attach the front of the banner to the flying line 2. A similar line or cord 21 may be used to attach the end of the banner to the flying line 2.

Figure 3A shows a further type of banner system, which is similar to that of Figures 1 to 3 in every respect except for the alternative features which will now be described.

A drogue line 22 is connected to the flying line 2 at point 23 and to a drogue 24 or some other suitable drag device. The drogue line 22 slides freely through a ring or pulley 25. This drogue arrangement holds the leading edge of the banner against

the wind pressure to keep the banner unfurled and does not require the use of a weight or rigid element.

Figure 3A also shows a kite 27 to which the flying line 2 is attached.

Figures 4 to 7 show a system for "sky-launching" a kite in mid-air. This is in contrast to conventional launching methods which involve preparing the kite for launching on the ground and then launching the kite. Conventionally, inflated kites are usually inflated on the ground before launching.

Referring to Figure 4, the system 40 includes a container 41 containing a kite (not visible in Figure 4). The kite has a number of bridle lines 42 which connect the kite to a flying line 43. The flying line 43 runs from the ground to a pilot kite 44 as shown in Figure 8, and two or more kite containers 41 may be connected to the flying line.

The kite container 41 has an opening 45 which is closed by a closure. In the example shown, the closure includes a number of loops 46 through which a closing line 47 can pass. The closing line is terminated with a loop which cooperates with a pin 48 and ring or carabiner 49 to secure the closing line and therefore to keep the container closed.

The pin 48 is connected by line 50 to the container. The pin 48 is also connected to a control line 51 which runs down to a user standing on the ground, or on vehicle from which the kites are being flown. When the user wishes to launch the kite, he or she pulls on the control line 51, which cause the pin 48 to disengage from the ring 49, releasing the closing line 47. This in turn releases the loops 46 and the container is open, as shown in Figure 5.

A kite 55 begins to emerge from the container 41. At least some of the bridle lines 42 are connected around an open leading edge of the kite 41. This helps to keep the open leading edge to the wind and therefore promotes inflation of the kite. As

the kite continues to emerge (see Figure 6) the open leading edge is still maintained towards the wind to encourage further inflation.

Finally, the kite 55 is completely released from the container 41. The kite fully inflates and the container 41 falls from the sky where it can be retrieved by a user. The container 41 and pin 48 remain attached to the control line 51, which facilitates their retrieval.

The container 41 is preferably a kite bag formed from a light fabric to minimise the load on the pilot kite. The container could be of a long tubular form. For launching over water the bottom of the container or bag may be left open, or be formed from a mesh, such that water can drain from the container. Kites flown over water are sometimes packed wet, and this will allow water draining from the kite to escape.

The kite may be packed into the container trailing edge first and folded in a fan-like manner. The bridle lines 42 are at least partly kept outside the container to maximise the chance of successful launch, but may be bundled using a weak cord, rubber band or the like which will give way when the kite is launched.

The ring or carabiner 49 is connected to a pilot line 52. As will be apparent to the skilled reader, it is possible to eliminate the section of flying line between the carabiners 53 and 54, connecting the pilot kite directly to the carabiner 49 and pilot line 52.

The pilot kite could be replaced by some other suitable form of pilot lifter.

The release mechanism could be controlled in any suitable manner allowing a user to control release of the kite. For example, the release mechanism could include an actuator and an antenna for receiving a wireless signal from a remote controller. In this case a control line 51 is not required.

This method of launching a kite is particularly advantageous for launching kites over water. As the kite is launched in mid-air, there is less risk of the kite taking on water which could prevent successful launch. Kites, particularly large inflated kites, tend to take on water when launched from the water surface. This can prevent successful launch by imposing a load on the kite and preventing proper inflation. Furthermore, when towed behind a boat, a large kite in the water can create significant drag. This drag is greater if the kite has taken on water (i.e. there is water inside the kite) but exists even if no water has been taken on.

Where the kite is flown from a vehicle, such as a boat, the likelihood of a successful launch can be improved by increasing the boat speed when the kite is released from the container. This increases the effective wind speed at the kite and therefore promotes inflation of the kite. This is likely to be particularly advantageous in light winds.

In addition, mid-air launching of kites is expected to be popular in kite shows and exhibitions due to the unexpected appearance of a large kite in mid-air.

As shown in Figures 4 to 7, the Applicant has found that large show kites can be flown from a reduced bridle set consisting of five or less bridle lines connected at or near to the leading edge of the kite. This is particularly so with large show kites (often in the shape of animals) having a single ram-air opening at or near the leading edge. A small number of bridle lines can be connected to the kite around the opening. For example, a single line can be attached above the opening. Three lines could be used, with one above and one on either side of the opening. This reduced bridle set reduces the chance of tangles or the bridle lines catching on other objects. This is particularly advantageous where flying kites from a boat, since bridle lines can become tangled in the boat's propeller.

The reduced bridle set reduces the chances of bridle lines catching or tangling on each other, the kite or other equipment (such as the kite container, carabiners etc). This is expected to provide an improved chance of successful launch.

Figures 9 and 9A show a valve for controlling flow of air into or out of an inflatable aerodynamic form such as a ram air inflated kite 55. The valve 56 may be in the form of a substantially frustoconical fabric valve formed by sewing a fabric layer or a number of fabric panels into this shape. As shown in Figure 9A, where panels are used the side panel of the valve preferably has the shape of a truncated isosceles triangle. The conical shape helps to maintain a higher pressure within the form. However, other substantially tubular shapes may be suitable for many applications.

The open front end 57 is sewn around an opening 58 at or near the kite's leading edge. In use, when pressure inside the form exceeds pressure at the opening 58, this pressure acts on the fabric wall of the valve 56, causing the tubular valve wall to collapse onto itself. This prevents air from flowing out of the form and therefore helps to maintain the form in an inflated state.

The valve 56 may be sewn onto the top skin of the inflatable form, as shown in Figure 9. This has several advantages. First, the valve is secured substantially along its length to the top skin. This prevents the valve from becoming tangled up in itself, reducing the likelihood of valve failure.

Second, the orientation of the valve may assist in inflation of the kite as the kite is launched from a container. As shown in Figure 5, a kite emerges from the container with a low angle of attack, different to its higher angle of attack in its ordinary flying orientation. Throughout the range between the low angle of attack during launch and the higher angle of attack when flying normally, the orientation of the valve ensures that it is always oriented suitably for ram-air inflation of the kite.

Third, the "non-return" nature of the valves also helps to prevent water from leaking into the kite when it is flown over water. The internal pressure is retained and water prevented from leaking in through the valve when the kite is lying on the surface of the water. A valve with parallel or even divergent tube walls (rather than convergent walls as shown in Figure 9A) will still be a non-return valve of this type.

These valves may be used on pilot kites, large display or show kites, or any other suitable aerodynamic form.

Figure 10 shows an alternative means for launching kites over water. A skirt 60 is attached to the back of a boat 61 in such a manner that the top of the front edge of the skirt is maintained above the surface of the water. As the boat moves forward the skirt sits on top of the water. A kite can be laid on the skirt and inflated by the airflow provided by the wind, forward motion of the boat or a combination of the two. When the kite is inflated it will ascend off the skirt. The skirt prevents the kite from taking on sufficient water to prevent a successful launch.

Figure 11 shows an alternative skirt 62. The skirt is wider than the boat 61 and is connected to the boat using a wide boom 63, or some other suitable framework. Again the front edge of the skirt is kept above the water surface.

Figures 12 to 16 illustrate methods of attaching an aerodynamic form, preferably a kite, to a vehicle.

With reference to Figure 12, a boat 70 is equipped with a capstan winch 71 and a pulley 72. A flying line 73 is passed through the pulley 72 and engages with the capstan winch 71. The flying line can be paid out to launch a kite.

Once a desired length of flying line has been paid out, the flying line can be engaged with a V-line attachment system as shown in Figure 13. A V-line 75 is a single piece

of line connected to the boat at two points 76, 77. The V-line is longer than the shortest distance between the two points 76, 77.

The attachment of the flying line 73 to the V-line 75 is shown in detail in Figure 14. A pulley 79 rides over the V-line 75 and is attached to a securing mechanism 80 which holds the flying line 73. The securing mechanism is preferably a gripper which holds the flying line 73 without requiring any knots in the flying line. However, in some embodiments the securing mechanism could be a carabiner or the like to which the flying line can be tied.

In Figure 13 the flying line has been connected to the V-line, but the load from the flying line is still taken through the pulley 72 and capstan winch 71. The flying line can then be paid out further until the load comes onto the V-line system, as shown in Figures 15 and 16. The V-line 75 is now taut, with the load from the flying line 73 taken through the securing mechanism 80, pulley 79 and V-line 75.

The pulley 79 rides from side to side over the V-line. This effectively allows the connection of the flying line 73 to the boat to move from side to side. As the V-line can also pivot about its connection points 76, 77, the connection of the flying line 73 to the boat can also move forwards or backwards. This improves boat handling under the load imposed by the kite. The distribution of the load by the V-line allows the hull to tack or track at 90degrees to the flying line angle, without the stern being pulled down wind. The V-line automatically adjusts when the boat changes direction, for example adjusting to port or starboard side as the boat gybes or tacks. The V-line also automatically adjusts to the optimum loading position in three dimensions (bow/stern and starboard/port) depending on the boat direction, line angle and wind direction. The distribution of loads also eliminates or reduces heeling caused by the kite and eliminates or reduces stress on the boat's motor from over steering or correcting the motor.

Note that the two connection points 76, 77 could be at any desired point on the surface vehicle. In the case of a boat, the points may be as shown in the drawings, on either side of the boat near the stern. This has the advantage that the V-line and securing mechanism tend to extend from the stern of the boat and are therefore not in the way of normal boat operations. However, the connection points could include one point at the stern and one at the bow, for example.

The V-line could be replaced by a rigid or semi-rigid curved strut, the slider riding on the curved strut. Again, the strut is longer than the shortest distance between the two connection points. Preferably the strut would be connected to the boat so as to allow rotation of the strut around an axis defined by the two connection points, so as to maintain the three dimensional freedom of the attachment point, as described above.

Figure 17 shows a kite 90 connected by a number of bridle lines 91 to a flying line 92 via a steering module 93. The bridle lines includes a number of standard bridle lines 94 connected at a common attachment point 95. A line 96 connects the common attachment point 95 to the steering module 93 or flying line 92. A steering bridle line 98 is connected to the kite 90 at two points 99.

The steering module 93 rides over the steering bridle line 98, as shown in Figure 18. In this embodiment the steering bridle line 98 includes a central section formed as a toothed belt 100. A cog 101 in the steering module cooperates with the toothed belt 100, and can be driven to control the position of the steering module with respect to the steering bridle line 98. Figure 18A shows part of the steering module 93 and cog 101. As the cog is driven to rotate, the toothed belt 100 passes through the steering module. The steering module 93 remains fixed to the flying line 92, with the result that the kilt is forced to tilt sideways and will therefore move either to left or right.

Figure 19 shows an alternative embodiment in which the steering bridle line 98 passes directly around a driven spindle. No cog or toothed belt is required. As

shown in Figure 19A, the line may pass several times around the spindle in order to provide sufficient engagement between the spindle 103 and line 98. When the spindle is driven to rotate, the line 98 passes through the steering module 93, with the result that the kilt is forced to tilt sideways and will therefore move either to left or right.

Figure 20 is a schematic diagram of the steering module. A control module 110 is configured to communicate with a remote controller, allowing a user to steer the kite. These communications may be made over a wireless link, via antenna 111. The control module controls an actuator 112 which may be a servo motor linked to the cog 101 or spindle 103. Thus a user can control motion of the cog or spindle and thereby steer the kite.

The steering module may be arranged to stay in or return to a default point in the event of failure. The default point may be a neutral point is one where the steering module has no steering effect. Alternatively the default point may be some other point. For example, the Applicant has found it desirable to steer a kite to the outside of a turn when towing the kite behind a boat. The default point may therefore be one which results in steering to the outside, e.g. to the left for a clockwise circuit. In the event of failure the user is then simply constrained to continue in a clockwise circuit, but may continue to fly the kite successfully.

This can be achieved by programming the control module 110 to respond to a failure or to a determination that failure is imminent by driving the cog or spindle so as to move the steering module along the steering bridle line 98 to the default point. Alternatively, the steering module could be configured to release its grip on the steering bridle line 98 in the event of failure or a determination that failure is imminent, thereby ensuring that the steering module will naturally ride to the neutral point.

The failure could be a failure in the steering module, a controller arranged to communicate with the steering module or in a communication link between the steering module and the controller.

In one embodiment, the steering module could also be arranged to release one or more other bridle lines (which could extend all the way to the steering module rather than terminating at the common point 95). This would result in the kite essentially falling from the sky and may therefore be useful as a safety mechanism. At least some of the lines to be released may be at or near the kite's leading edge.

This steering mechanism may be applied in any kites where steering is desired. It may be particularly useful for steering pilot kites flying above large show kites.

Where a kite is being flown from a boat or other vehicle, the steering mechanism could be used to keep kites to the outside of the vehicle when turning. Without any steering mechanism kites tend to slip towards the inside of the turn, lose wind and can fall to the surface. This means that a very large turning radius (typically more than 100 metres) is required with large show kites. The Applicant's steering mechanism allows a much tighter turn to be performed, with the kite steered to the outside of the turn.

It could be used to steer a pilot kite so as to position a kite container (as described above) in a desired manner before launching a kite from the container.

In the embodiment shown the 'B bridle lines' (the second set of lines from the leading edge) are adjusted. The Applicant has found these lines to be very sensitive to adjustment in parafoil style pilot kites. The effect of adjusting these lines is illustrated in Figures 22A and 22B. Figure 22A shows a parafoil kite 140 in a neutral mode. In Figure 22B, the parafoil kite is in a turning mode. The bridle line B has been shortened which reduces the camber along that side of the kite. This reduces lift and causes the kite to turn towards that side. Lengthening the corresponding 'B' bridle

on the other side of the kite will have the same steering effect (by increasing lift on the other side of the kite). Shortening the 'B' bridle on one side while lengthening the 'B' bridle on the other is also effective.

However, many other configurations may be used in order to steer the kite, including: adjusting the A bridles (those closest to the leading edge); adjusting the C bridles; pulling in the trailing edge corner; adjusting the height of the tip profile at the leading edge; and a combination of any or all of the above methods.

It is particularly beneficial to pull in the B bridle line while simultaneously letting out the C bridle line on the same side of the kite (in a parafoil with three bridle connections on each side of the kite); or more generally, pulling in one bridle line while letting out a bridle line closer to the trailing edge but on the same side of the kite. This alters the camber of the kite, as illustrated in Figures 23A and 23B. Again, the lift on that side of the kite is reduced resulting in a similar steering effect to that described above. The opposite adjustment (i.e. letting out B while pulling on C) has an opposite steering effect.

This change in camber is more pronounced and more reliable than the change through B bridles alone discussed above, since in addition to the alteration allowed by the B bridle the trailing edge is also allowed to lift, as shown in Figure 23B. Again, adjustments on one side of the kite can be combined with opposite adjustments on the other side of the kite.

It is possible to alter the shape of a kite or other aerodynamic form by using controlled inflation of chambers within the form. Such a form requires one or more dynamically controllable valves which are controlled automatically or manually in order to inflate or deflate one or more modifiable chambers. This results in modification of the shape of the modifiable chamber. The modifiable chambers are designed and/or positioned such that this change also results in a change in the shape of the aerodynamic form. This may be a local change, such as a change

close to the tip of the form, or could result in a larger scale change, such as a change to the chordwise shape of the form. Such features may be particularly suitable for kites (particularly large show kites) which do not steer well by pulling on different bridle lines. This is especially true of kites with aspect ratios less than 1. It is also true of kites having the reduced bridle sets discussed above, since fewer or no bridle lines are available for steering.

These changes in shape can therefore be adapted to steer the kite to the left or right, up or down, to resist luffing or achieve other desired flying characteristics.

This arrangement is particularly applicable to ram-air inflated forms such as ram-air inflated kites. However, it can also be applied to single skin kites or any other type of aerodynamic form, including kites, parachutes, parafoils and paragliders.

A pump or fan may be used to cause inflation or deflation of the modifiable chamber.

Alternatively, and whether or not the form is a ram-air inflated form, the modifiable chamber may be a ram-air inflated chamber. In this case, "assisted" ram air inflation may be used, in which a pump or fan is used to aid ram air inflation.

Any suitable valves may be used for the controllable valves, including: butterfly valves, slide valves, controllable flaps, irises or draw cords.

The aerodynamic form may be equipped with a control module which communicates with a remote controller over a suitable communications link, preferably a wireless link. The controller sends control data to the control module, which operates the dynamically controllable valves in accordance with those instructions. The instructions may be automatically created, for example in response to information on the form's position, orientation, heading, tilt etc. Alternatively, the control instructions may be sent in accordance with user instructions (e.g. 'steer to the left'). These instructions may be input by any suitable means.

The control module may control one or more actuators to actuate the valves. Alternatively, the remote controller may communicate directly with the actuators.

Figure 21 shows a section along the chord of a kite 120. A main chamber 121 extends from the leading edge 122 of the kite 120 to an internal baffle 123. The internal baffle includes apertures or is formed from a suitable fabric to allow air to flow from the main chamber 121 into a tail chamber 125. Air is also allowed to flow into a modifiable chamber 126 from the main chamber 121 through a dynamically controllable valve 127. A second dynamically controllable valve 128 may be provided to control flow from the modifiable chamber 126 to the outside of the kite 120.

Thus, by controlling the valves, the pressure in the modifiable chamber can be controlled. Pressure differences between the internal pressure of the modifiable chamber 126 and pressure external to the modifiable chamber then govern the shape that the modifiable chamber will assume and its effect on the shape of the kite as a whole. In this case the external pressures include pressures in the main chamber and the tail chamber and the pressure outside of the kite around the external surface of the modifiable chamber. Figure 21A shows that this particular embodiment allows the chordwise shape of the kite to be controlled. In particular, the tail section can be pushed upwards by appropriate adjustment, using the controllable valves, of the pressure in the modifiable chamber 126.

Thus the modifiable chamber may force other parts of the aerodynamic form into a desired shape. In other embodiments, inflation of the chamber may itself be the change of shape that is desired.

The pressure in the modifiable chamber can be controlled continuously over an operating range. This means that the changes in shape are also continuously controllable, rather than on/off type changes.

This method can be applied to any desired part of the aerodynamic form, to alter any desired aspect of the spanwise or chordwise shape of the form. The pressure in the modifiable chamber can be controlled by one or more valves controlling ingress of air into the chamber; or by one or more valves controlling egress of air from the chamber; or by two or more valves controlling both ingress and egress of air.

Figures 24 to 29A illustrate a further embodiment of launch arrangement and attachment system for an aerodynamic form to be launched and/or flown from a surface vehicle. The vehicle may be a four wheel motorbike or ski-mobile, boat, car, truck or some other vehicle, but preferably is a jetski or personal watercraft (PWC). These craft are manoeuvrable, widely available and can be run at low cost, making them very suitable for displaying at various events, festivals or the like.

According to this embodiment, the PWC is fitted with a pair of launch members 150, one on each side of the PWC. The launch members may be mounted to rotate with respect to the PWC between a retracted position shown in Figure 24 (in which they extend generally forwards) and an extended launch position shown in Figure 25 (in which they extend generally backwards and upwards). Figure 24A is a front view of the launch members in the retracted position, showing that the launch members pivot so as to come closer together in the retracted position compared to the extended launch position (shown from the front in Figure 25A).

These drawings also show that the launch members are curved towards their ends, towards the horizontal when in the extended position.

Where the aerodynamic form is attached to each end of the launch member 150 is provided with an attachment point such as that shown in Figures 26 and 26A, although many types of releasable attachment will occur to those skilled in the art and are intended to fall within the scope of the invention.

Each attachment point includes a recess 152 formed near the end of a launch member 150. A pin 154 slides inside the launch member 150 to close the recess in the position shown in Figure 26. A loop 156 of line or steel ring can therefore be secured to the launch member by the pin 154 passing through that loop / ring. The pin 154 may be biased to this closed position by a length of elastic line 158, or a spring or any other suitable arrangement. A controllable release arrangement includes a control line 160 attached to the pin 154 which, when pulled, causes the pin 154 to be retracted, thereby opening the recess 152 and releasing the loop / ring 156. The control line / ring could be replaced by some other form of remote actuator.

In operation, a kite or other aerodynamic form can be attached to the attachment points of the launch members while the launch members are in the retracted position. Here the attachment points are within reach of the operator or driver of the PWC in a substantially natural operating / driving position and with the driver's weight positioned towards the front of the PWC. The launch members can then be rotated to the extended launch position. Once the kite is inflated and ready for launch the control line 160 can be actuated by means of a control mechanism (e.g. a lever operated by the driver's hand or foot) to launch the kite.

The embodiment may be used in conjunction with a variant of the bag launch method described above. Figures 27 to 29 show a kite (or other aerodynamic form) contained in a container 164 (e.g. a bag). The kite is attached to the attachment points at the extremities 165 of its span. A first release line 166 allows the driver to release the kite from the container 164. This arrangement is more clearly shown in Figure 27A. The release line 166 pulls a pin from a loop 168 to open the container, in a similar manner to that described above with reference to Figures 4 to 7. The line 166 is attached to the container 164 for retrieval of the container after the kite is released.

The kite remains attached to the launching members. In the case of a ram-air inflated kite, the kite inflates in the position shown in Figure 28. Once inflation is

sufficiently complete for launch, the release mechanism on the launching members 150 can be activated and the launching members retracted as shown in Figure 29.

Figures 27 to 29 show a winch 170 and fairlead 172 mounted to the PWC 151. The winch rotates about a first, horizontal axis and preferably has a hollow shaft within which a hydraulic motor can be positioned. The hydraulic motor can be powered by a hydraulic power pack fitted to the PWC with suitable connections to the winch.

A hydraulic motor is preferred for this application because it is suited to marine and water elements, is provides for progressive control (e.g. by a lever) and allows free spooling of the winch under the line tension with manual adjustment of a braking force. However, any suitable motor may be used.

The fairlead may be mounted to the winch and rotates about the first axis, or some other axis parallel to the first axis. The fairlead is preferably biased towards an upright position. Thus where no load is applied to the fairlead, as in Figures 27 and 28, the fairlead may extend substantially vertically. This helps to avoid tangling of the kite's flying line.

The winch and fairlead are preferably rotatably mounted to the PWC 151. Figure 29 shows an arm 175 which mounts to a substantially vertical shaft 176 which can rotate freely about a substantially vertical axis. Thus the winch rotates with respect to the PWC about an axis that is substantially transverse to the winch's own inherent axis of rotation.

This arrangement allows the winch and fairlead to pivot from left to right under tension from the kite's flying line 177, and automatically adjusts for changes in the orientation of the kite 178 and the PWC 151.

Line preferably unwinds from the winch without torque being applied by the motor. However, a brake may be provided, or a control mechanism can be used where the

hydraulic motor resists unwinding, in order to control the speed at which line unwinds from the winch.

The winch preferably allows replaceable drums to be easily removed from the winch, to allow different drums to be used. Thus different drums carrying different lines can easily be used with the same winch.

Furthermore, the Applicant's systems allow aerodynamic forms, including kites, and other flexible components such as the banners described above and below or other display or decorative components to be wound directly onto the drum without the need for removal from the line. Thus different drums can carry different aerodynamic forms and/or display or decorative components and can easily be interchanged on the winch.

Figure 30 shows a further embodiment of banner system. The banner system may be generally similar to that described above, or alternatively a single (i.e. not user-configurable) display element may be used. In this banner system a primary lifter in the form of a pilot kite 27 provides the main lift to the banner 1 via the flying line 2. However, an auxiliary lifter 180 is also provided and provides further lift to the banner via an auxiliary line 181. The auxiliary line is preferably connected either to the banner 1 or to the flying line 2 at or near the leading edge of the banner 1.

Two or more auxiliary lifters could also be used and these could be spaced along the length of the banner. The auxiliary lifters each fly above the banner and flying line 2. the use of auxiliary lifters reduces the load on the primary lifter and alters the overall angle of the flying line 2.

Figures 31 to 32A show a further embodiment of a kite 185. The kite has one or more skins 186 which together define an inflatable volume. The kite has a leading edge 187 and a trailing edge 188. Positioned at or near the trailing edge 188 are a number of openings, or preferably, valves 189. These openings or valves allow air

to flow out of the inflatable volume when the pressure inside the volume exceeds a threshold. Where an opening is used, the threshold may simply be the external pressure. However, valves are preferred and these can define a greater threshold, which is desirable especially when flying a kite in low wind conditions when it can be difficult to keep the kite fully inflated.

The use of such openings and valves is particularly advantageous when combined with the winch systems described above. The kite 185 can be retrieved by winding it straight onto the winch, with the pressure within the kite being released through the openings or valves 189 for deflation of the kite. Where a fairlead, or some other restriction, is used, the fairlead will press against the kite as the deflating kite passes through it. This also assists with deflation of the kite. In practice a stop/start winding action with the winch is likely to be most useful when winding a kite through the fairlead in this way. This is particularly suited to single line kites.

Figure 32 shows a valve 189 in greater detail, in a closed position. The valve may include a pair of plastic plates 191, 192 which lie against each other in the closed position. When the pressure inside the kite is greater than a threshold it is sufficient to deform the plastic plates as shown in Figure 32A, causing the valve to open.

Figures 33 and 33A show an alternative valve 189, which includes a fabric or similar tube 194. In the closed position of Figure 33, the fabric tube is rolled up and secured in this position by a strap or tie 196. The strap or tie may for example be secured by a hook and fastener tab (e.g. Velcro or the like). When the pressure inside the kite exceeds a threshold, the strap or tie gives way and allows the fabric tube 194 to unroll to the open position shown in Figure 33A.

Many other forms of suitable valve will occur to the skilled reader.

Figure 34 shows a further embodiment. A kite 200 is connected to a flying line 2 by a number of bridle lines 201. A release mechanism 202 is provided at the junction of

the flying line and bridle lines (although the release mechanism could be positioned elsewhere, for example on the flying line, on a bridle line or on the kite). A retrieval line 203 is connected to the kite (preferably at or near the trailing edge) and to the flying line 2.

The release mechanism includes some mechanism for releasing or severing one or more of the bridle lines and/or the flying line. When this occurs, the kite is connected to the flying line only by the retrieval line 203 and will simply fall from the sky. This is therefore a useful safety mechanism which can be employed if a kite gets too close to some obstacle or, for example, too close to the crowd at an event. The safety mechanism can also be used where the wind unexpectedly and suddenly increases in force.

Preferably a control arrangement is also provided. In the embodiment shown the control arrangement includes a controller 205 which communicates over a wireless link 206 with the release mechanism 202.

Figure 35 is a schematic diagram showing the controller 205 in more detail. The controller includes an actuator 207, a power supply 208 (e.g. a battery) and a transmitter 209. The actuator may be user-actuated or may be automatically actuated. When the actuator is actuated, power is supplied to the transmitter to send a signal to the release mechanism. The release mechanism includes a receiver to receive the signal.

The controller may be configured to be carried on the body of a user (e.g. the driver of the surface vehicle discussed above). This may be useful in the event that the driver of a jetski or PWC falls off the vehicle – they will still be able to prevent safety issues by activating the release mechanism. Alternatively, the controller may be mounted on a vehicle.

Many forms of release mechanism may be suitable. Mechanical mechanisms could rely on a simple latch and small motor. A preferred and very lightweight option (shown in Figure 36) is to use a resistive wire 210, switch 211, small battery 212 and a heat-sensitive component. The switch is actuated by a controller 213 which receives a signal from e.g. the remote controller 205. When the switch is actuated, the wire heats up and causes the heat-sensitive component to fail. The heat-sensitive component may be a length of synthetic line, and could even be provided by the flying or bridle lines. In Figure 36 the flying line 2 forms the heat-sensitive component and is simply tied to the resistive wire 210. Alternatively a wax component could be used, with the wax failing when it is heated. Various other mechanisms will occur to the skilled reader.

Although many embodiments above have been described with reference to jetskis or PWCs, they may equally be used with other forms of surface vehicle.

While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in detail, it is not the intention of the Applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departure from the spirit or scope of the Applicant's general inventive concept.

Claims

1. A user-configurable banner system for mounting to a flying line, including:
a plurality of individual flexible display components, wherein a desired banner can be formed by joining selected individual display components to each other and wherein at least some of the individual display components are configured for attachment at their top edges to a flying line; and
means for resisting the wind pressure at the banner's leading edge to keep the leading edge of the banner unfurled.

2. A system as claimed in claim 1 wherein the means for resisting wind pressure is a weight configured for attachment to the bottom of the leading edge of the banner.

3. A system as claimed in claim 1 wherein the means for resisting wind pressure includes a drogue arrangement free of weights or rigid elements.

4. A system as claimed in claim 1 wherein each individual flexible display component includes a flexible grid and a display element connected to the flexible grid.

5. A system as claimed in claim 4 wherein the display elements include one or more of: letters, numerals, graphical elements, logos, symbols, signs and insignia.

6. A system as claimed in claim 4 or 5 wherein selected individual display components are joined to each other by joining their respective flexible grids to each other.

7. A system as claimed in any one of claims 4 to 6 wherein the flexible grids are formed from cord, tape or line.

8. A system as claimed in any preceding claim wherein the flying line is a kite flying line.

9. A system as claimed in any preceding claim, free of rigid structural elements.

10. A system as claimed in any preceding claim wherein at least some of the individual flexible display components include loops along their top edges through which the flying line passes.

11. A system as claimed in any preceding claim including attachment means for attaching the banner to the flying line at its leading and trailing edges.

12. A display system including a banner system as claimed in any preceding claim attached to a flying line having an average angle to the horizontal in the range 20 to 60 degrees.

13. A banner system for mounting to a flying line, including:
a banner attached to a flying line;
a primary lifter connected to the flying line; and
an auxiliary lifter on an auxiliary line, the auxiliary line being connected to the banner or to the flying line at or near the banner.

14. A system as claimed in claim 13 wherein the primary and auxiliary lifters are kites.

15. A system as claimed in claim 13 or 14 wherein the auxiliary lifter is connected at or near the leading edge of the banner.

16. A system as claimed in any one of claims 13 to 15 wherein the auxiliary lifter flies above the banner and flying line.

17. A container-launch kite system including:
a kite;
a flying line attached to the kite;
a kite container configured to hold the kite and having an opening closed by a closure; and
a release mechanism for controlled remote release of the closure after the kite container has been raised into the air;
wherein, in use, the kite contained in the kite container can be raised into the air , and the closure can be released by a remotely positioned user using the release mechanism, thereby releasing the kite from the kite container.

18. A system as claimed in claim 17 wherein the release mechanism includes an engagement element which can be released by pulling on the engagement element with a release line to which it is attached.

19. A system as claimed in claim 18 wherein the release line or engagement element is also attached to the kite container to facilitate retrieval of the kite container after release of the kite.

20. A system as claimed in any one of claims 17 to 19 wherein the kite container is a kite bag.

21. A system as claimed in any one of claims 17 to 20 including a plurality of bridle lines connecting the kite to the flying line and arranged around an opening of the kite so as to keep the opening to the wind after the kite has been released from the kite container so as to promote ram air inflation of the kite.

22. A method of launching a kite including:
raising a kite container containing a kite into the air; and
releasing the kite from the container.

23. A method as claimed in claim 22 wherein the kite container is raised by a pilot lifter .

24. A method as claimed in claim 23 wherein several kite containers each containing a kite are raised using a single pilot lifter.

25. A method as claimed in claim 24 wherein the kites are attached to a single flying line.

26. A method as claimed in any one of claims 22 to 25 wherein the kite container is a kite bag.

27. A method as claimed in any one of claims 22 to 26 wherein bridle lines connect the kite to a flying line and are kept substantially outside the kite container.

28. A sky-launch kite container having a closure including a release mechanism enabling controlled remote release of the closure after the kite container has been raised into the air, thereby releasing a kite contained in the kite container.

29. A container as claimed in claim 28, in the form of a kite bag.

30. A launching skirt configured for attachment to the stern of a boat such that, in use, the leading edge of the skirt is maintained above the surface of the water, such that the skirt sits on the surface of the water behind the boat, allowing an inflatable aerodynamic form to be launched from the skirt without taking on sufficient water to prevent successful launch.

31. A launching skirt as claimed in claim 30 configured for attachment to a boom wider than the boat.

32. A steerable kite including:

an aerodynamic form;

a plurality of bridle lines for connecting the aerodynamic form to a flying line, the bridle lines including one or more steering lines; and

a steering module;

wherein the steering module is configured to be connected to the flying line and to ride over one or more steering bridle lines, each steering bridle line being connected to the aerodynamic form at two or more connection points.

33. A kite as claimed in claim 32 wherein the steering module is configured to return to a default point in the event of failure or a determination that failure is imminent.

34. A kite as claimed in claim 33 wherein the failure is a failure in the steering module, a controller arranged to communicate with the steering module or in a communication link between the steering module and the controller.

35. A kite as claimed in claim 32 wherein the steering module is configured to release its grip so as to ride freely over the steering bridle line or lines to the default point in the event of failure or a determination that failure is imminent.

36. A kite as claimed in any one of claims 32 to 35 wherein the steering module is configured to release one or more bridle lines as a safety mechanism.

37. A kite as claimed in claim 36 wherein at least some of the lines to be released are at or near the kite's leading edge.

38. A kite as claimed in any one of claim 32 to 37 wherein the steering module is configured to receive control signals from a remote controller.

39. A kite as claimed in claim 38 wherein the steering module is configured to communicate over a wireless link with the remote controller.

40. A kite system including a kite as claimed in any one of claims 32 to 39 acting as a pilot kite for one or more other kites.

41. A steerable kite including:
an aerodynamic form,
a plurality of bridle lines for connecting the aerodynamic form to a flying line, the bridle lines including one or more steering lines; and
a steering module;
wherein the steering module is configured to be connected to the flying line and at least one of the steering lines and is configured to return to a default point in the event of failure or a determination that failure is imminent.

42. A kite as claimed in claim 41 wherein the failure is a failure in the steering module, a controller arranged to communicate with the steering module or in a communication link between the steering module and the controller.

43. A kite as claimed in claim 41 wherein the steering module is programmed to return to the default point in the event of failure or a determination that failure is imminent.

44. A kite as claimed in any one of claims 41 to 43 wherein the steering module is configured to release one or more bridle lines as a safety mechanism.

45. A kite as claimed in claim 44 wherein at least some of the lines to be released are at or near the kite's leading edge.

46. A kite as claimed in any one of claims 41 to 45 wherein the steering module is configured to receive control signals from a remote controller.

47. A kite as claimed in claim 46 wherein the steering module is configured to communicate over a wireless link with the remote controller.

48. A kite system including a kite as claimed in any one of claims 41 to 47 acting as a pilot kite for one or more other kites.

49. An attachment system for attaching an aerodynamic form to a surface vehicle, including:
a V-line or strut connected at two points to the vehicle, the length of the V-line or strut being greater than the shortest distance between the two points;
a slider riding on the V-line or strut;
a securing mechanism connected to the slider and configured to attach to a flying line connected to the aerodynamic form.

50. An attachment system as claimed in claim 49 wherein the slider is a pulley.

51. An attachment system as claimed in claim 49 or 50 for use with a boat or ship.

52. A ram air inflated kite having a bridle set consisting of five or less bridle lines positioned at or near the kite's leading edge and configured to connect the kite to a flying line.

53. An inflatable aerodynamic form including:
top and bottom skins at least partly defining a ram air inflatable volume;
an opening at or near a leading edge of the form, opening into the ram air inflatable volume;
a valve including a flexible valve wall defining a substantially tubular flow passage, the flexible wall being attached to the top skin and being configured to deform to close the flow passage when the pressure in the ram air inflatable volume is greater than the pressure at the opening.

54. An inflatable aerodynamic form as claimed in claim 53 wherein the flow passage, when open, has a cross-sectional area which decreases towards a trailing edge of the form.

55. An inflatable aerodynamic form as claimed in claim 53 or 54 wherein the flexible wall is attached to the top skin substantially along its length.

56. A modifiable aerodynamic form having a shape for interacting with a fluid moving relative to the aerodynamic form, the shape of the aerodynamic form being defined at least in part by one or more flexible skins; the aerodynamic form including one or more dynamically controllable valves for controlling ingress of fluid to and/or egress of fluid from a modifiable chamber so as to control a pressure difference or differences between the internal pressure of the modifiable chamber and a pressure or pressures external to the modifiable chamber so as to modify the shape of the modifiable chamber and thereby to modify the shape of the aerodynamic form.

57. A modifiable aerodynamic form as claimed in claim 56 wherein the form can be steered through operation of the dynamically controllable valves and resulting modification of the shape of the aerodynamic form.

58. A modifiable aerodynamic form as claimed in claim 56 or 57 wherein modification of the shape of the modifiable chamber results in a modification of the chordwise shape of the aerodynamic form over at least part of its span.

59. A modifiable aerodynamic form as claimed in any one of claims 56 to 58 being a kite.

60. A modifiable aerodynamic form as claimed in claim 59 being a ram-air inflated kite.

61. A modifiable aerodynamic form as claimed in claim 59 being a substantially single skin kite.

62. A modifiable aerodynamic form as claimed in any one of claims 56 to 58 being an inflated form.

63. A modifiable aerodynamic form as claimed in claim 62 being a kite, parachute, parafoil, or paraglider.

64. A modifiable aerodynamic form as claimed in claim 62 or 63 being a ram-air inflated form.

65. A modifiable aerodynamic form as claimed in any one of claims 56 to 64 wherein the modifiable chamber is a ram-air inflated chamber.

66. A modifiable aerodynamic form as claimed in any one of claims 56 to 64 including a pump for inflating the modifiable chamber.

67. A modifiable aerodynamic form as claimed in any one of claims 56 to 65 including a pump for supplementing ram-air inflation of the modifiable chamber.

68. A modifiable aerodynamic form as claimed in claim 66 or 67 wherein the pump is a powered fan.

69. A modifiable aerodynamic form as claimed in any one of claims 56 to 68 wherein the controllable valves include one or more of: butterfly valves, slide valves, controllable flaps, irises or draw cords.

70. A modifiable aerodynamic form as claimed in any one of claims 56 to 69 including one or more actuators configured to receive control instructions from a controller and to operate the dynamically controllable valves.

71. A modifiable aerodynamic form as claimed in claim 70 wherein the actuator is configured to receive control instructions over a wireless communications link.

72. A launch arrangement for launching an aerodynamic form from a surface vehicle, including:

one or more launch members;

one or more attachment points on the one or more launch members configured to attach to one or more points of the aerodynamic form or bridle lines adjacent the aerodynamic form; and

a controllable release arrangement configured to controllably release the aerodynamic form or bridle lines from the attachment points for launching;

the one or more launch members being configured to move between a retracted position in which a crew member of the surface vehicle can reach the attachment points in order to attach the aerodynamic form thereto and an extended launch position.

73. A launch arrangement as claimed in claim 72 wherein each launch member is an elongate bar pivotally mounted to the surface vehicle to rotate between the retracted and extended positions.

74. A launch arrangement as claimed in claim 73 wherein the attachment points are positioned adjacent ends of the elongate bars and those ends are further apart in the extended position than in the retracted position.

75. A launch arrangement as claimed in any one of claims 72 to 74 wherein the launch members extend in the extended position generally upwards and backwards from the surface vehicle.

76. A launch arrangement as claimed in claim 72 or 73 wherein the bars are curved towards the horizontal towards their distal ends, when viewed in the extended position.

77. A launch arrangement as claimed in any one of claims 72 to 74 including two launch members, one on either side of the surface vehicle.

78. A launch arrangement as claimed in any one of claims 72 to 77 wherein the launch members extend generally forwards in the retracted position.

79. A launch arrangement as claimed in any one of claims 72 to 78 wherein the controllable release arrangement includes a remote release actuator allowing a user to actuate the release arrangement.

80. A launch arrangement as claimed in any one of claims 72 to 79 further including a container configured to contain the aerodynamic form while it is attached to the one or more launch members, and a further release arrangement for release of the aerodynamic form from the container.

81. A launch arrangement as claimed in any one of claims 72 to 80 wherein the surface vehicle is a jetski, personal watercraft, four wheel motorbike or ski-mobile.

82. An attachment system for attaching an aerodynamic form to a surface vehicle, including:

a winch having an inherent first axis of rotation and rotatably mounted to the surface vehicle so as to rotate about a second axis substantially transverse to the first axis.

83. An attachment system as claimed in claim 82 including a motor for driving the winch.

84. An attachment system as claimed in claim 83 wherein the motor is a hydraulic motor.

85. An attachment system as claimed in claim 84 wherein the hydraulic motor is positioned inside a shaft of the winch.

86. An attachment system as claimed in any one of claims 84 to 85 configured for line to unwind from the winch under its own tension, the system including a control mechanism connected to the hydraulic motor for controlling the speed of rotation of the winch while unwinding.

87. An attachment system as claimed in any one of claims 82 to 86 including a fairlead mounted with or to the winch so as to rotate with the winch about the second axis.

88. An attachment system as claimed in claim 87 wherein the fairlead also rotates about a third axis transverse to the second axis.

89. An attachment system as claimed in claim 88 wherein the third axis is the same as the first axis.

90. An attachment system as claimed in claim 88 or 89 wherein the third axis is substantially horizontal and the fairlead is biased towards a vertical orientation.

91. An attachment system as claimed in any one of claims 82 to 90 wherein the surface vehicle is a jetski, personal watercraft, four wheel motorbike or ski-mobile.

92. An attachment system as claimed in any one of claims 82 to 91 wherein the winch includes a replaceable drum.

93. An attachment system as claimed in any one of claims 82 to 92 configured for winding and unwinding of a line, wherein one or more aerodynamic forms and/or decorative or display components are wound onto and unwound from a winch drum together with the line.

94. A system as claimed in claim 17 wherein the container is lifted by a pilot lifter.

95. A system as claimed in claim 17 wherein the container is lifted by or onto one or more launch members.

96. An aerodynamic form safety or control system, including a control arrangement and a release mechanism, wherein the control arrangement is configured to control activation of the release mechanism to release or sever one or more lines included in or connected to the aerodynamic form.

97. A system as claimed in claim 96 wherein the control arrangement includes a controller configured to communicate over a wireless link with the release mechanism.

98. A system as claimed in claim 97 wherein the controller is configured to be worn by a user and includes an actuator for user-actuation of the controller.

99. A system as claimed in claim 97 or 98 wherein the controller is waterproof.

100. A system as claimed in claim 96 wherein the control arrangement includes a sensor, the control arrangement being configured to activate the release mechanism in response to information from the sensor.

101. A system as claimed in any one of claims 96 to 100 wherein the release mechanism includes a component for producing heat so as to cause failure of a heat sensitive component.

102. A system as claimed in claim 101 wherein the component for producing heat is a resistive wire, configured to burn through one or more lines included in or connected to the aerodynamic form.

103. A system as claimed in claim 101 wherein the heat sensitive component is a wax component.

104. A system as claimed in any one of claims 96 to 100 wherein the release mechanism includes a mechanical release element.

105. A system as claimed in any one of claims 96 to 104, wherein the release mechanism includes an electric power source and a switch.

106. A system as claimed in any one of claims 96 to 105, including a retrieval line which connects the aerodynamic form to a flying line after the one or more lines have been released or severed.

107. An inflatable single line kite including one or more skins defining an inflatable volume and one or more openings or valves remote from a leading edge of the kite and configured to allow flow of air from the inflatable volume to the outside of the kite when pressure in the inflatable volume exceeds a threshold.

108. A kite system, including:

a. an inflatable kite having one or more openings or valves remote from its leading edge such that air flows from an inflatable volume of the kite to the outside of the kite when pressure in the inflatable volume exceeds a threshold;

b. a flying line attached to the kite;

c. a winch onto which the flying line can be wound to retrieve the kite;

d. a fairlead through which the flying line passes at least during retrieval;

wherein, when the kite is retrieved by winding the flying line onto the winch, the kite passes through the fairlead, resulting in pressure in the inflatable volume exceeding the threshold and air flowing through the openings or valves to deflate the kite.

109. The system of claim 108 wherein the kite can be wound onto the winch together with the flying line.

110. The system of claim 108 wherein the valves are closed at normal operating pressures.

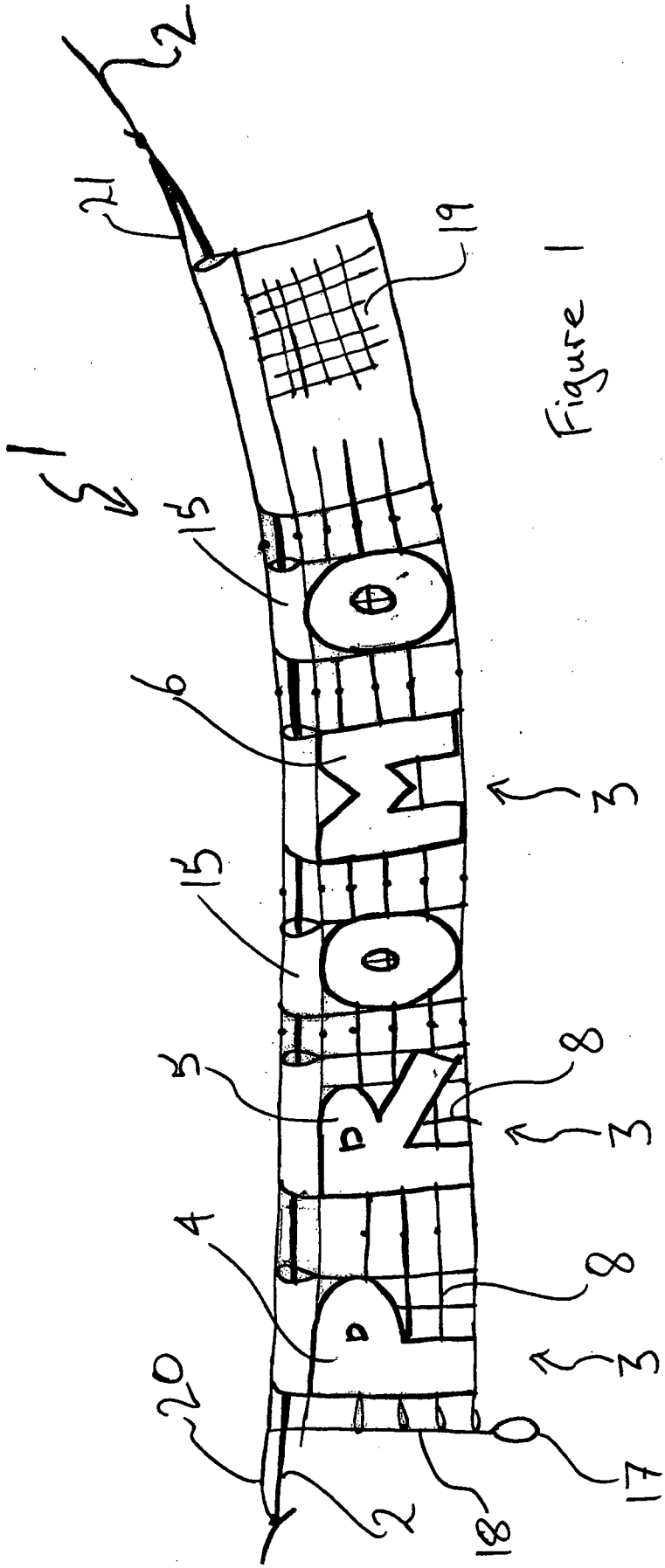


Figure 1

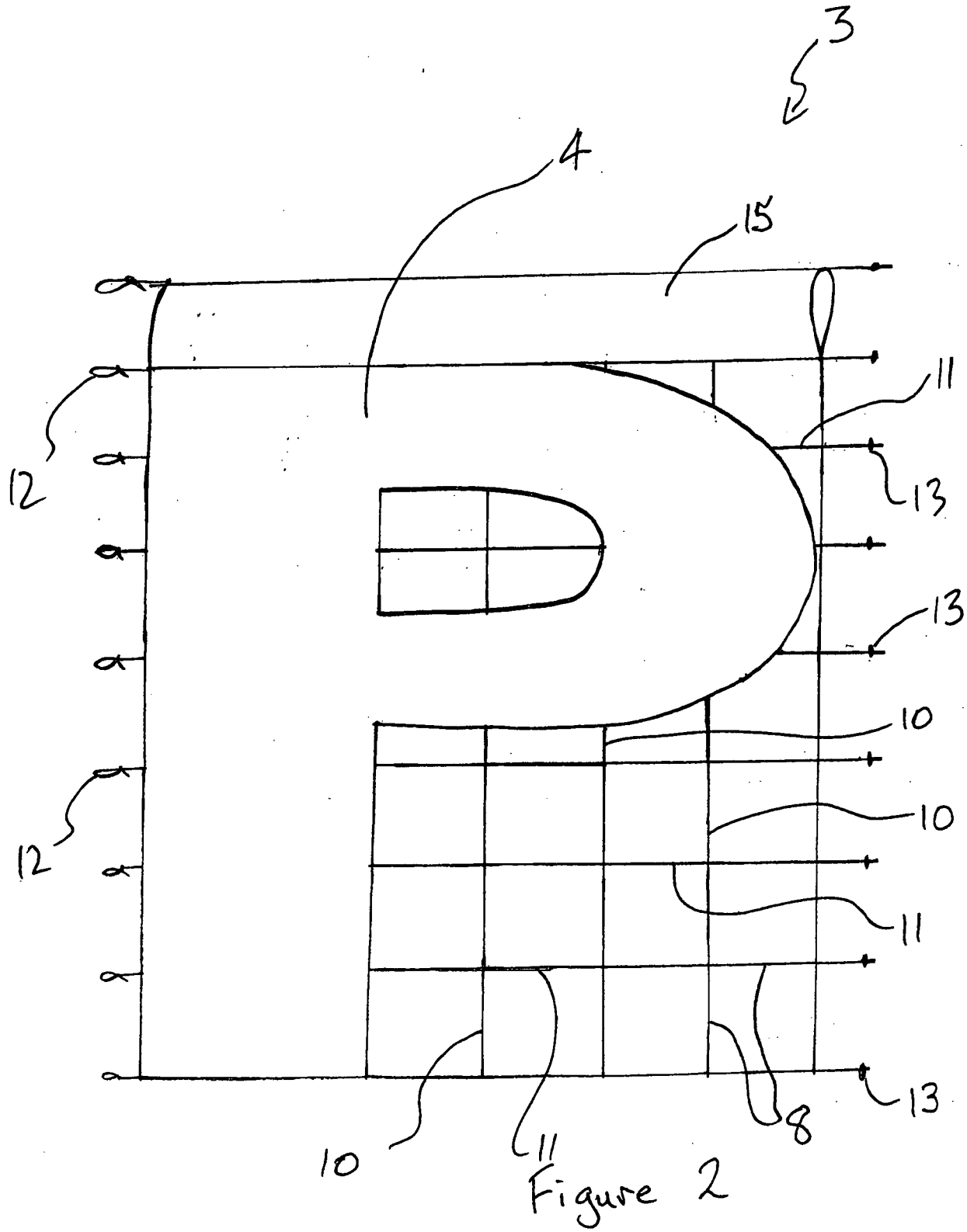
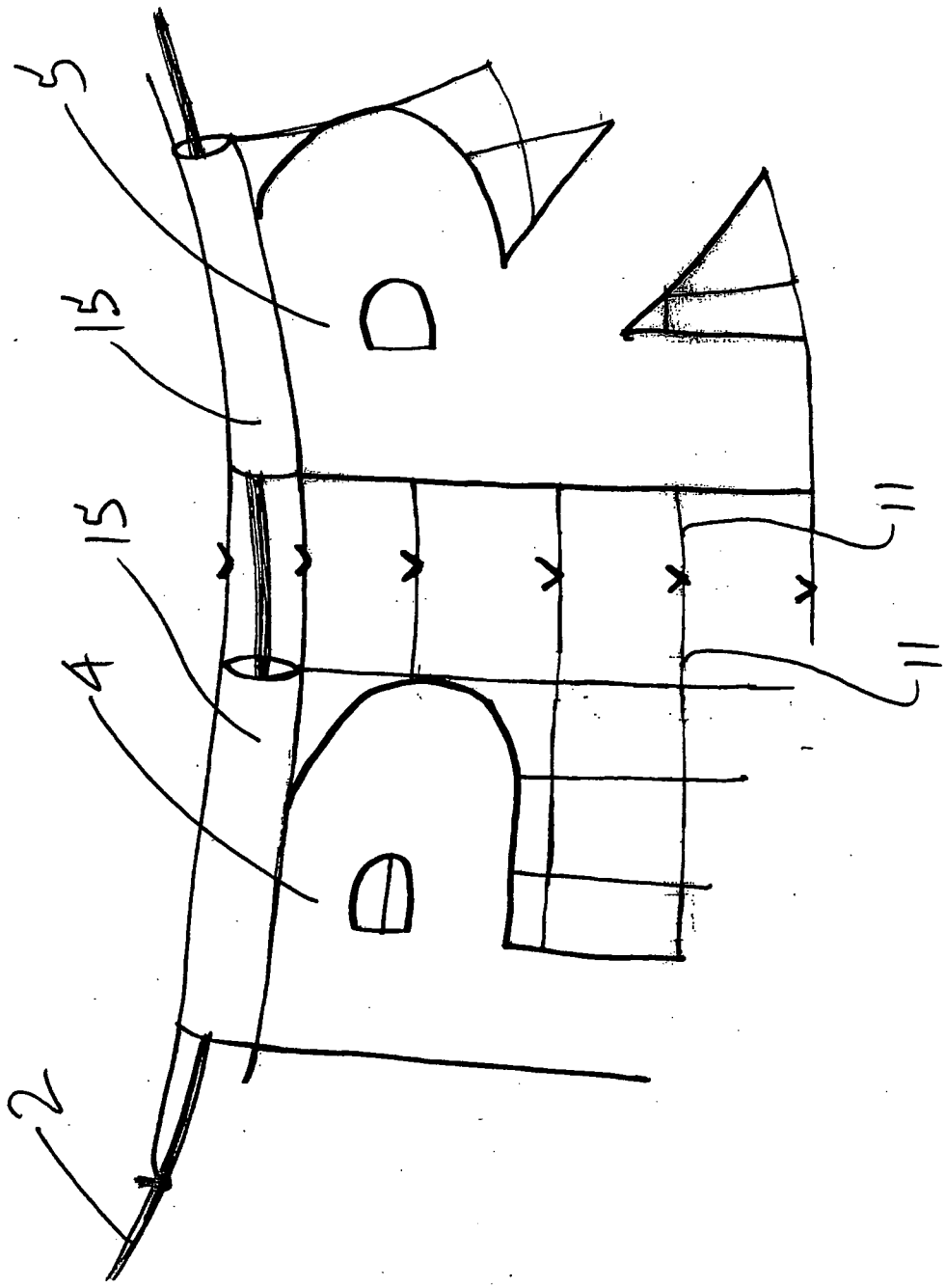


Figure 2

Figure 3



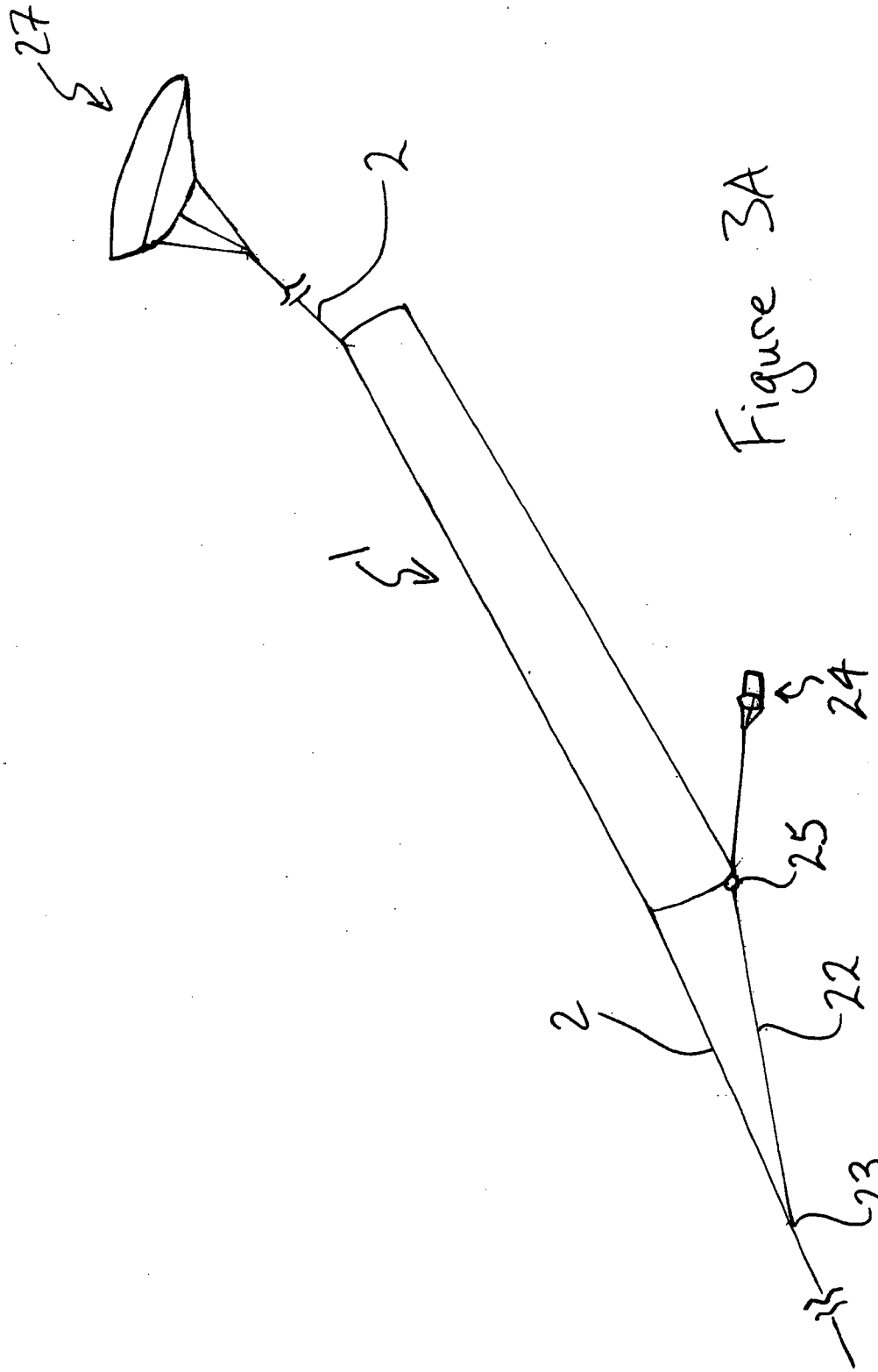


Figure 3A

Figure 4

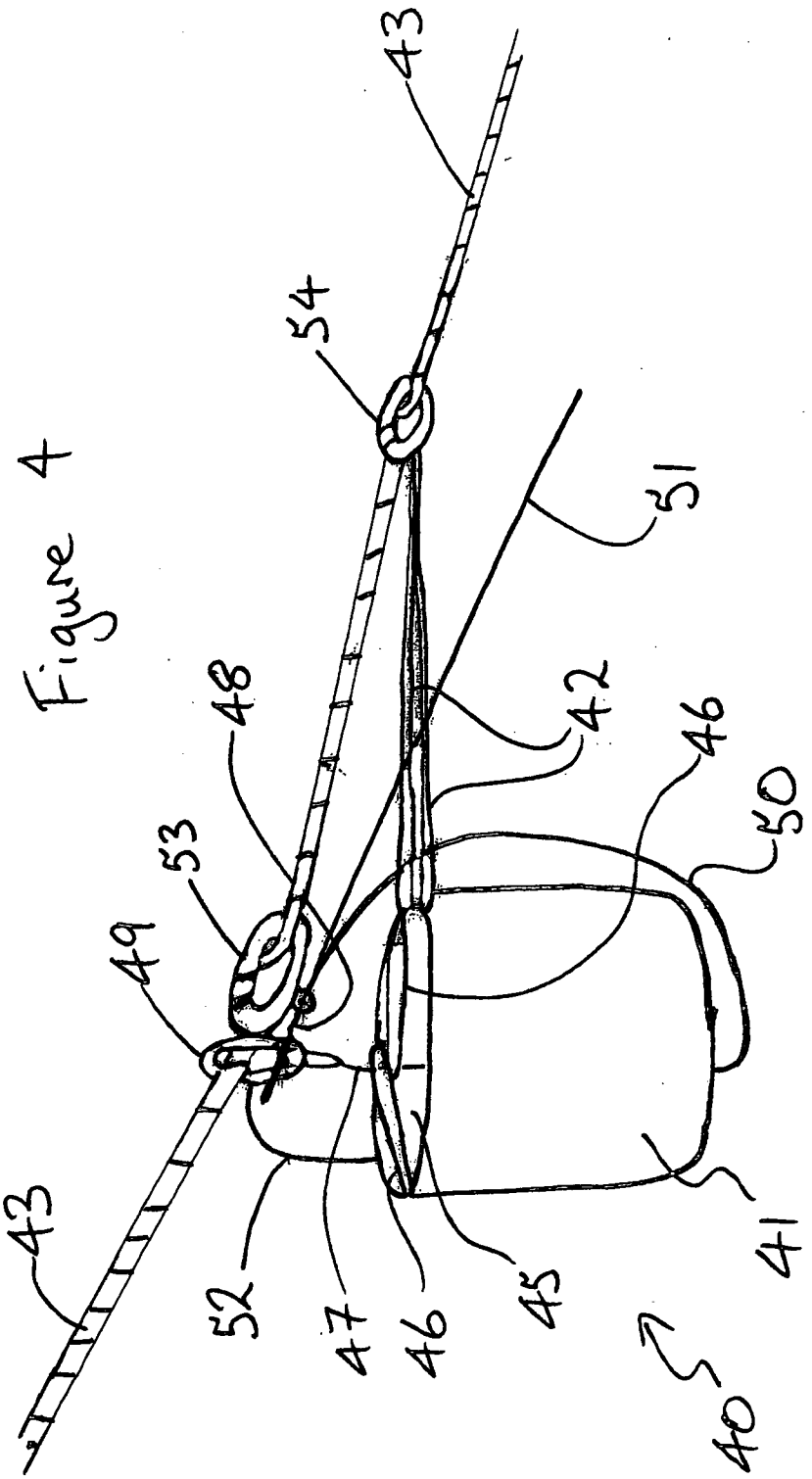


Figure 5

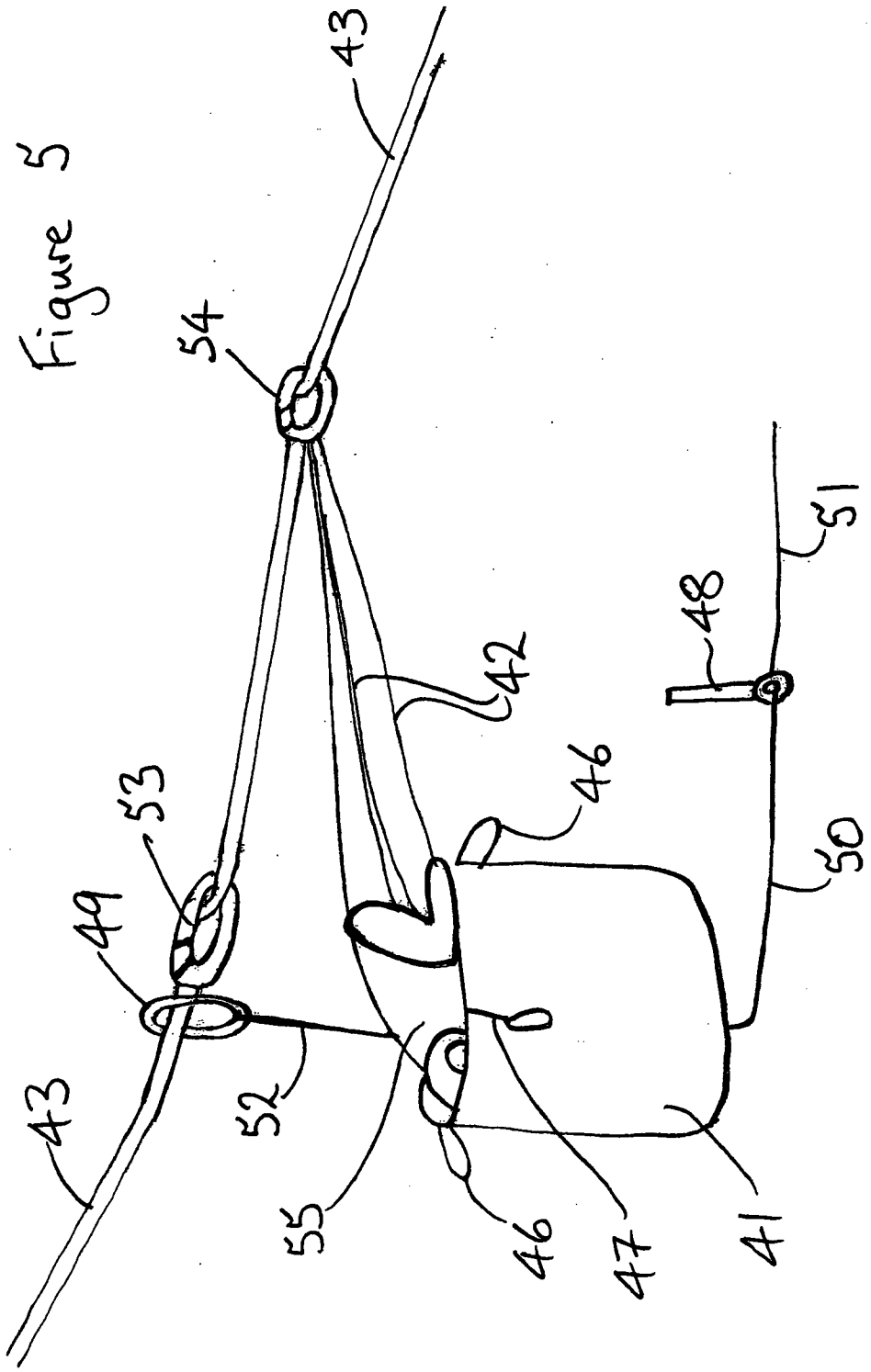


Figure 6

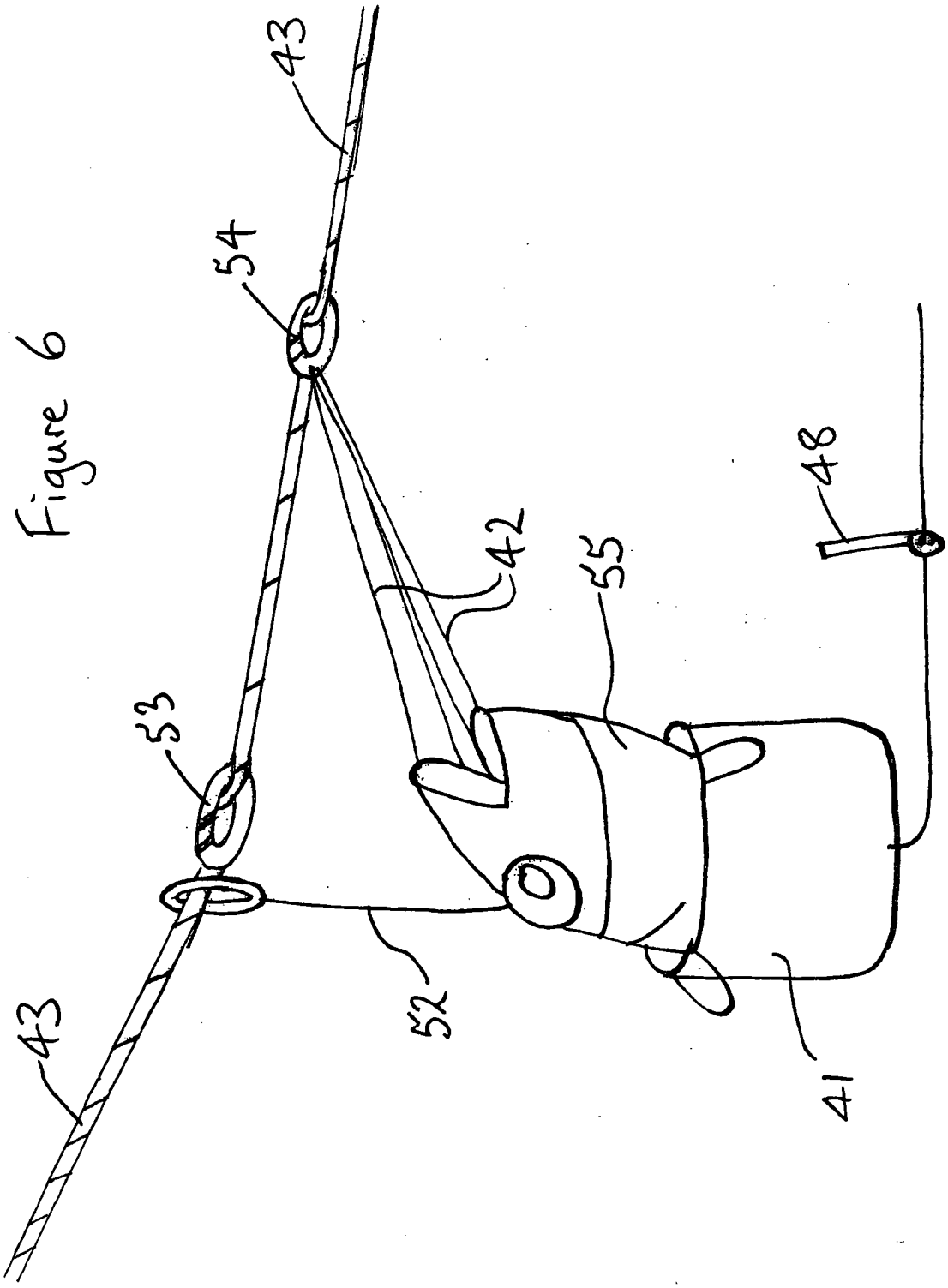


Figure 7

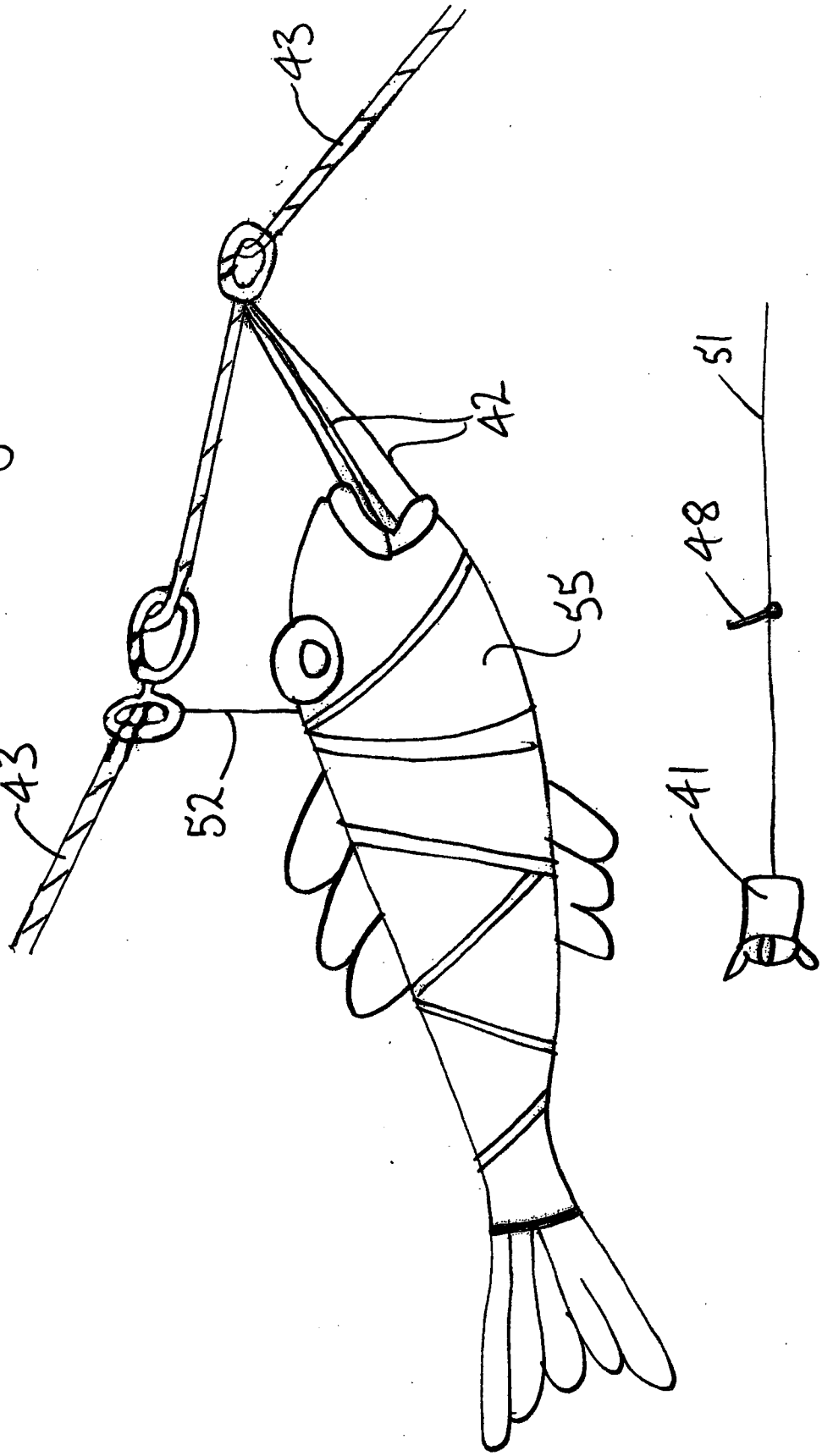


Figure 8

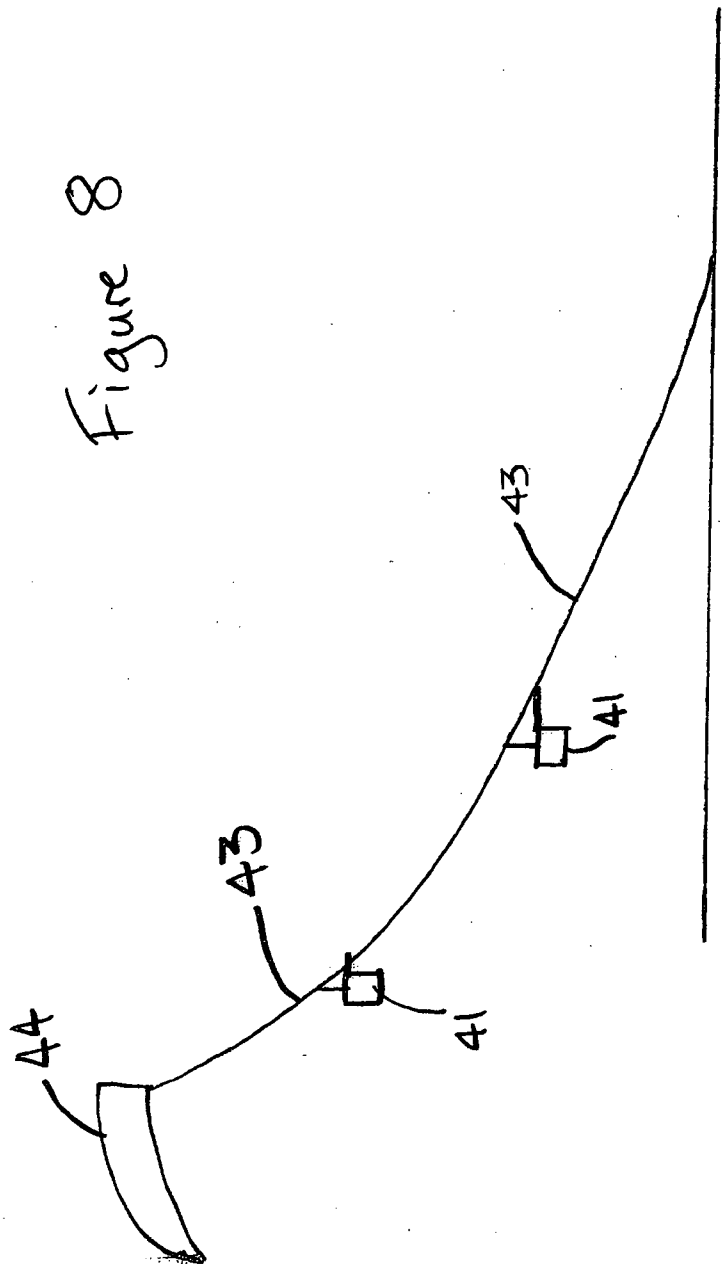
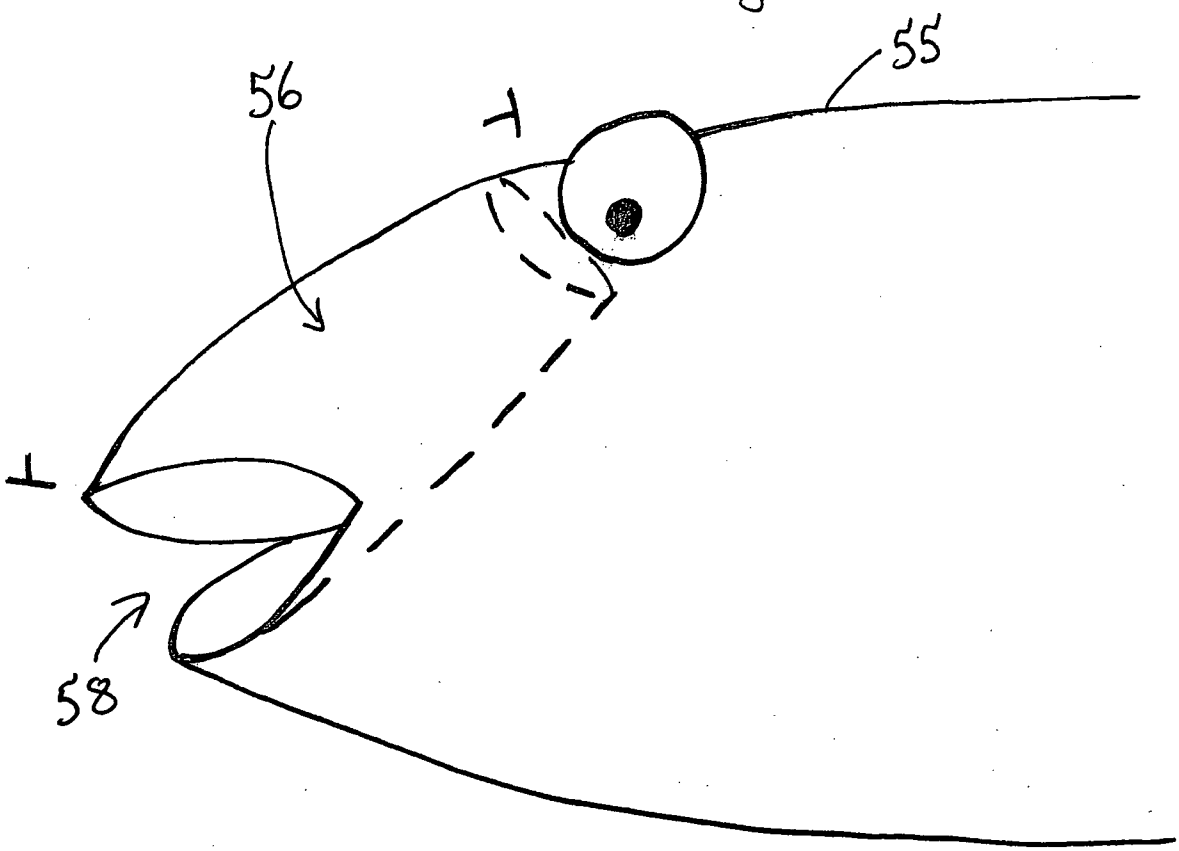


Figure 9



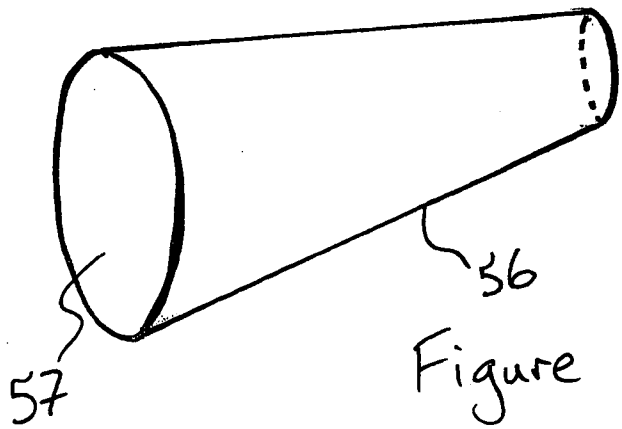


Figure 9A

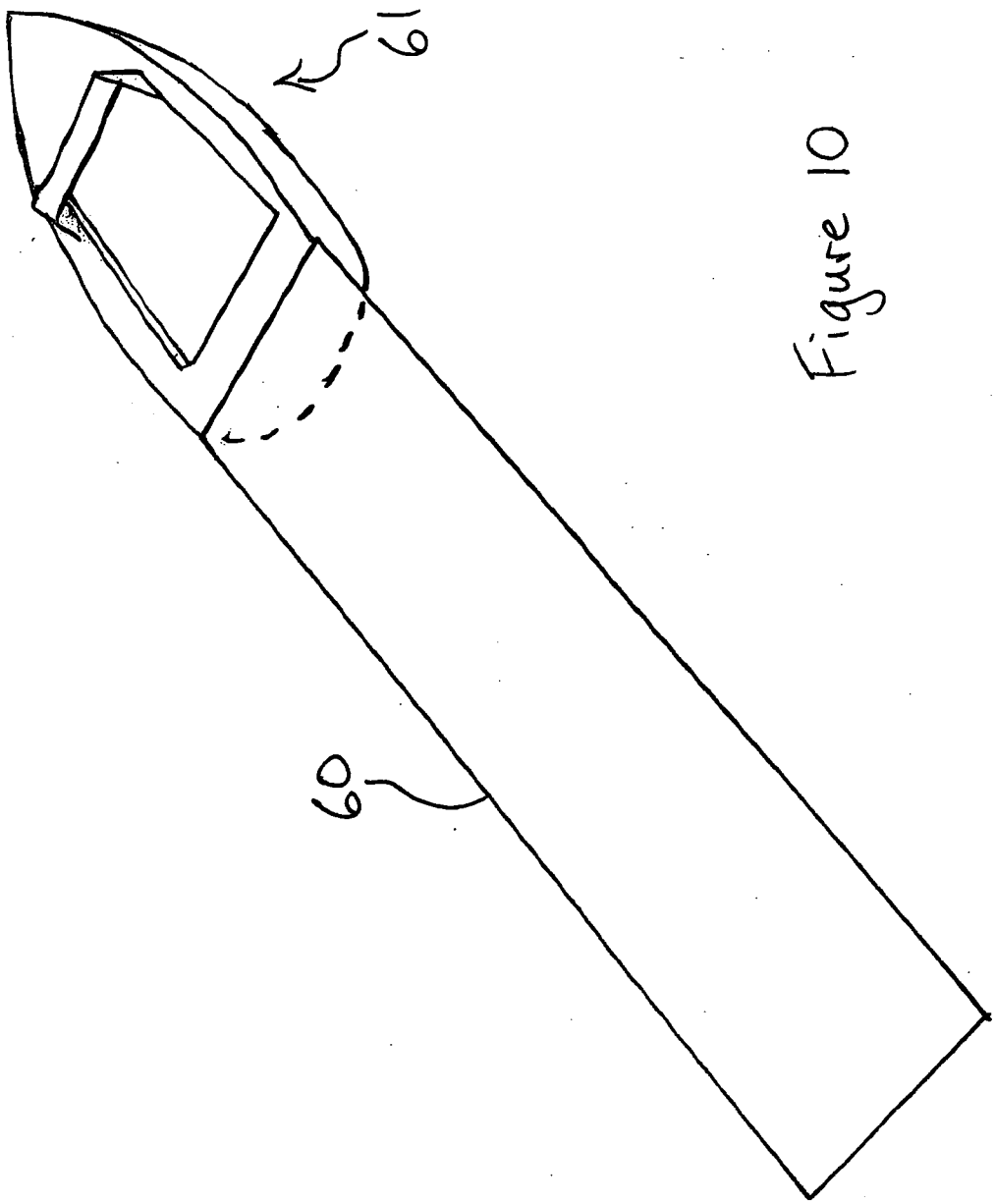


Figure 10

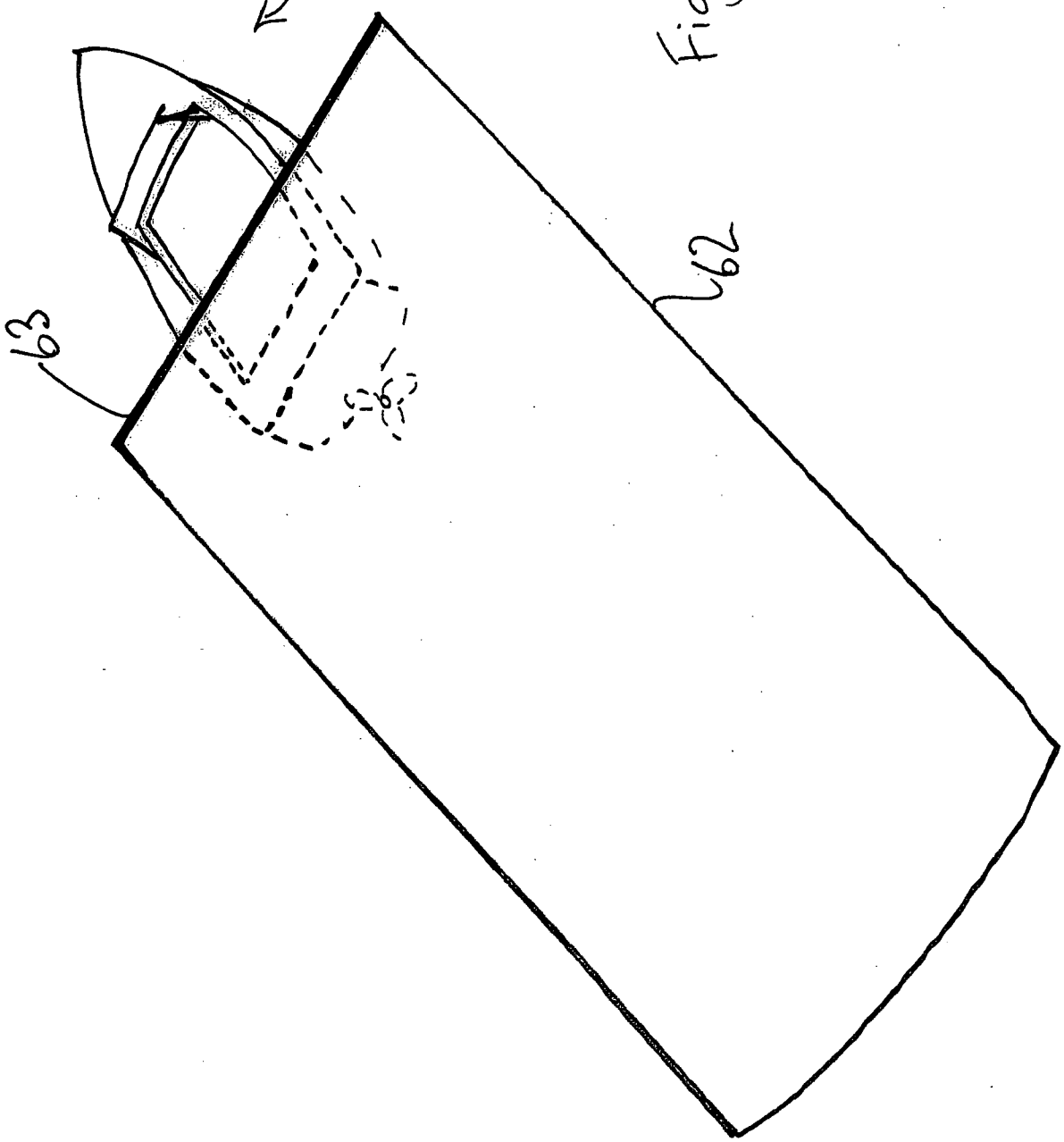


Figure 11

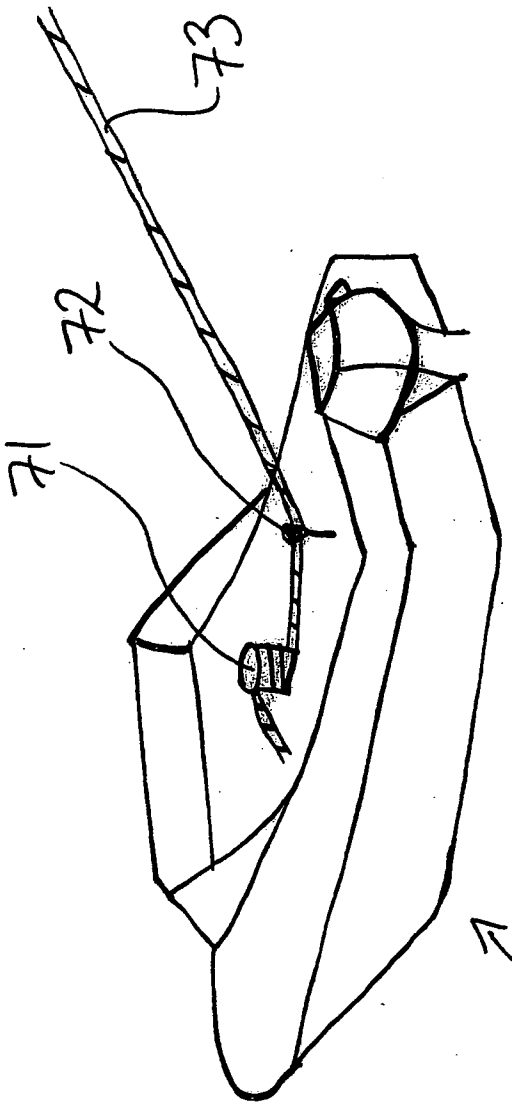


Figure 12

Figure 13

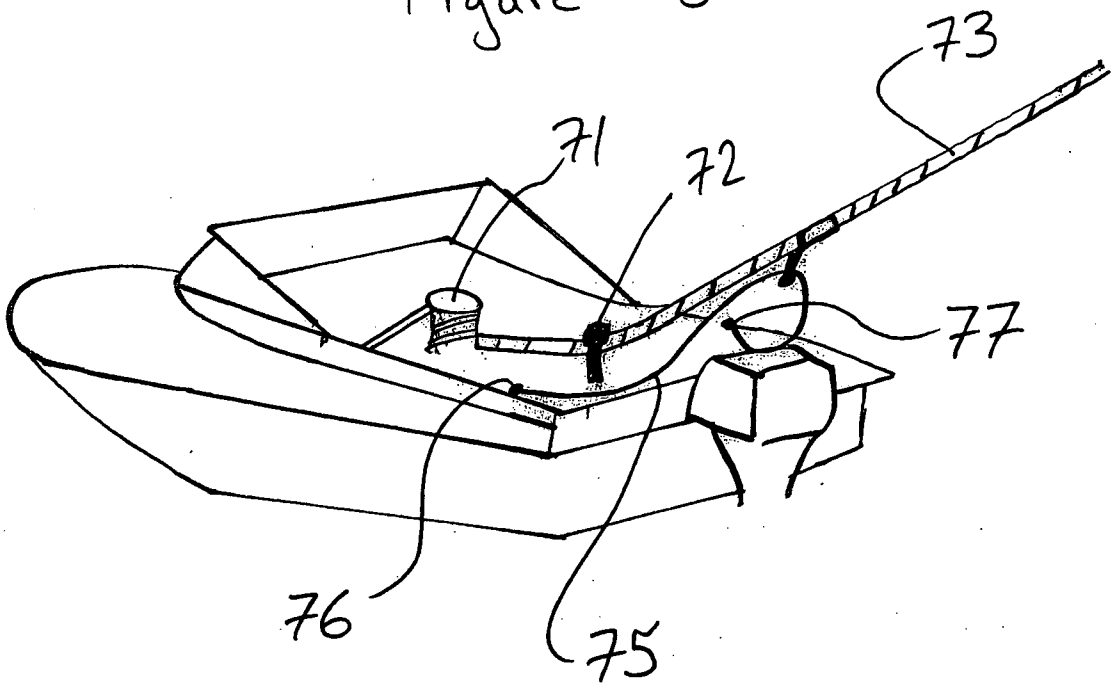


Figure 14

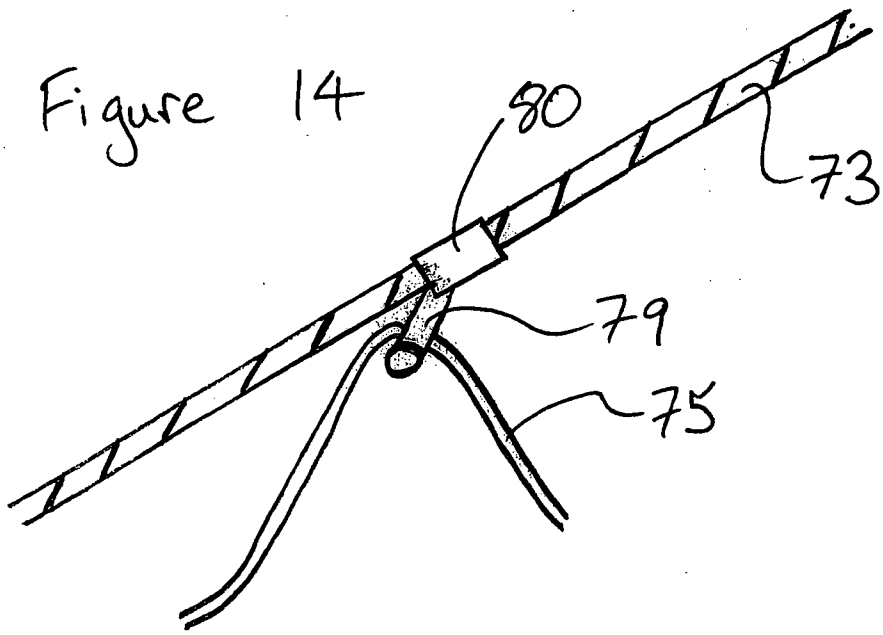


Figure 15

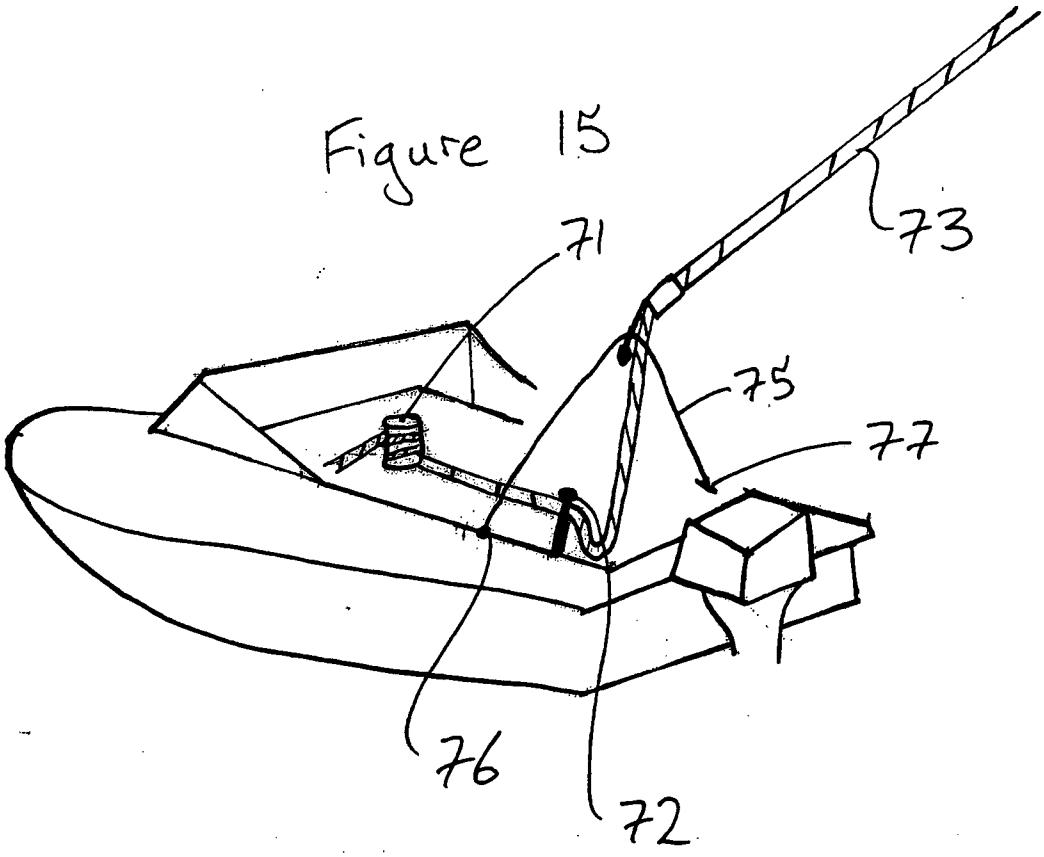
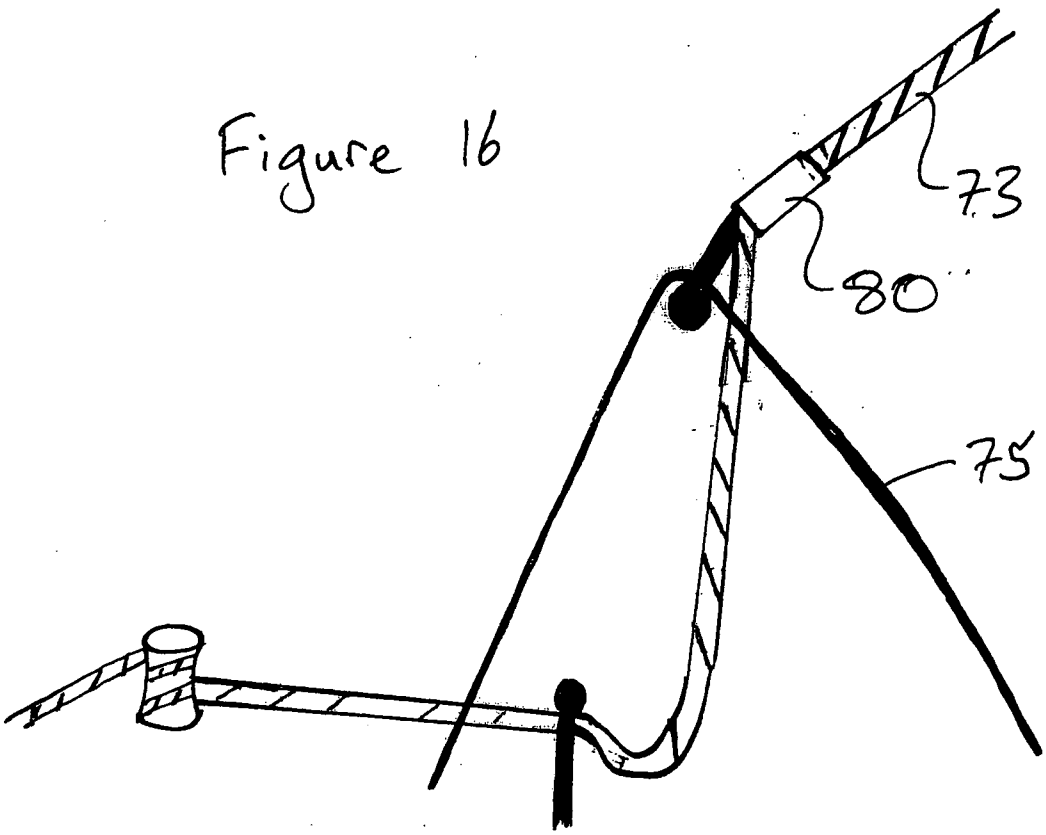


Figure 16



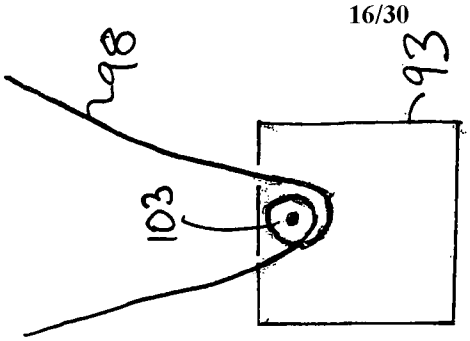


Figure 19

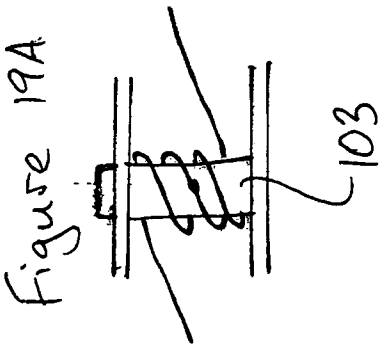


Figure 19A

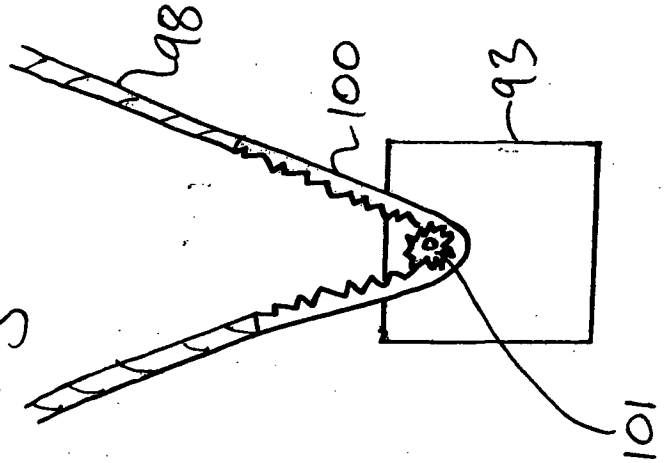


Figure 18

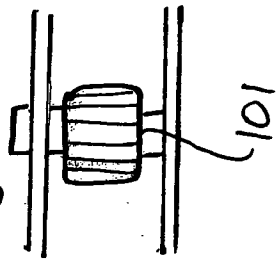


Figure 18A

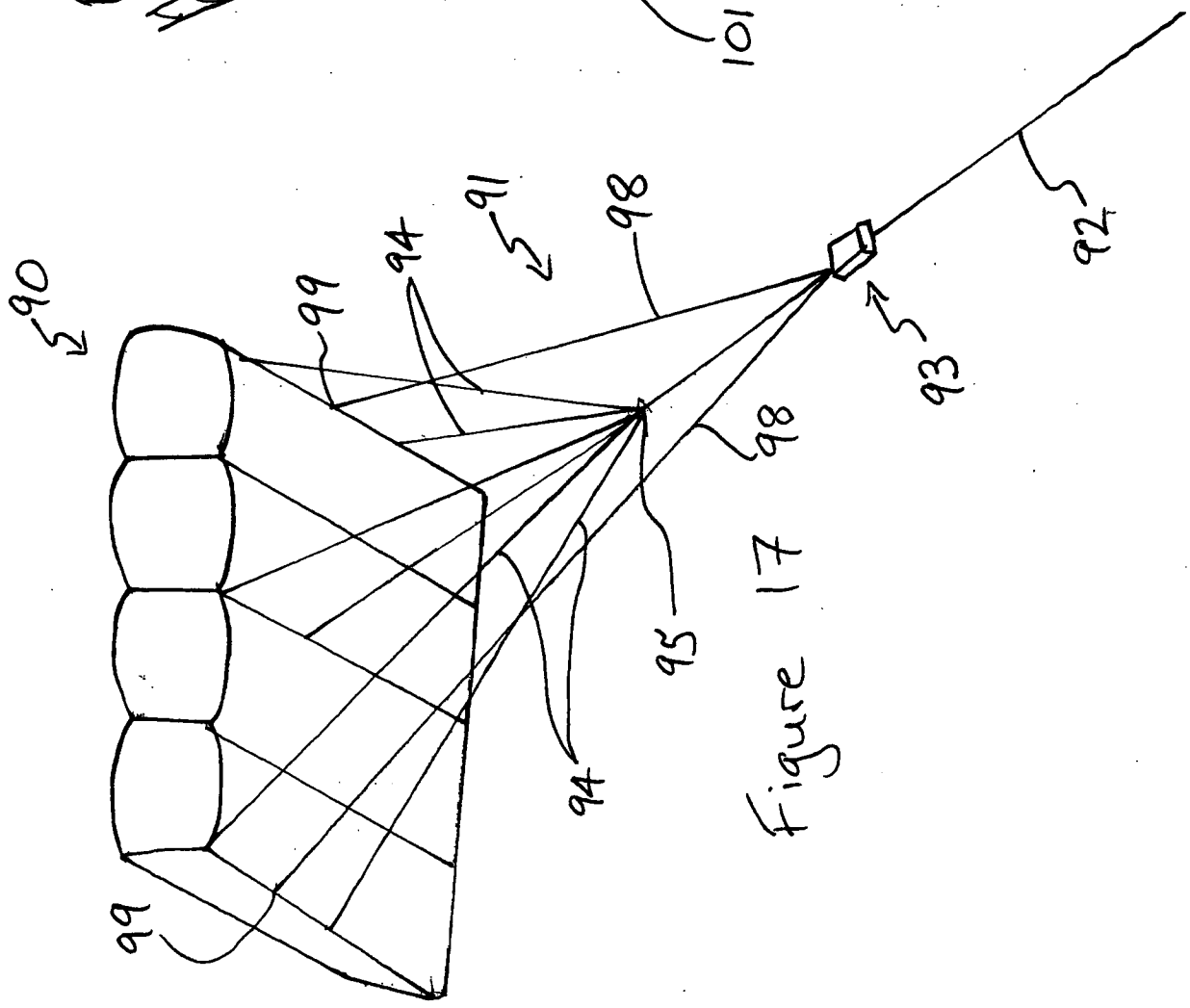


Figure 17

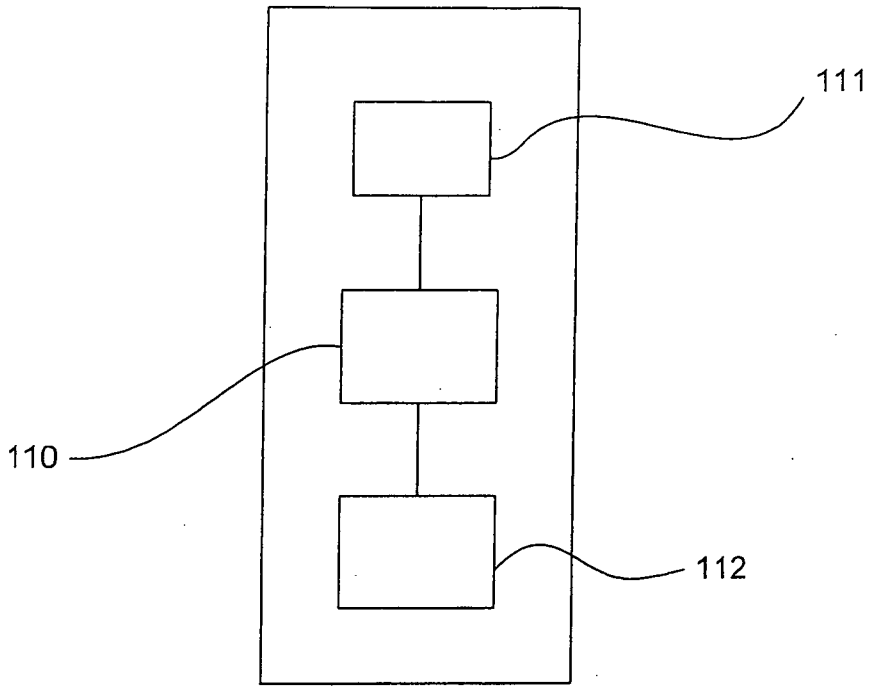


Figure 20

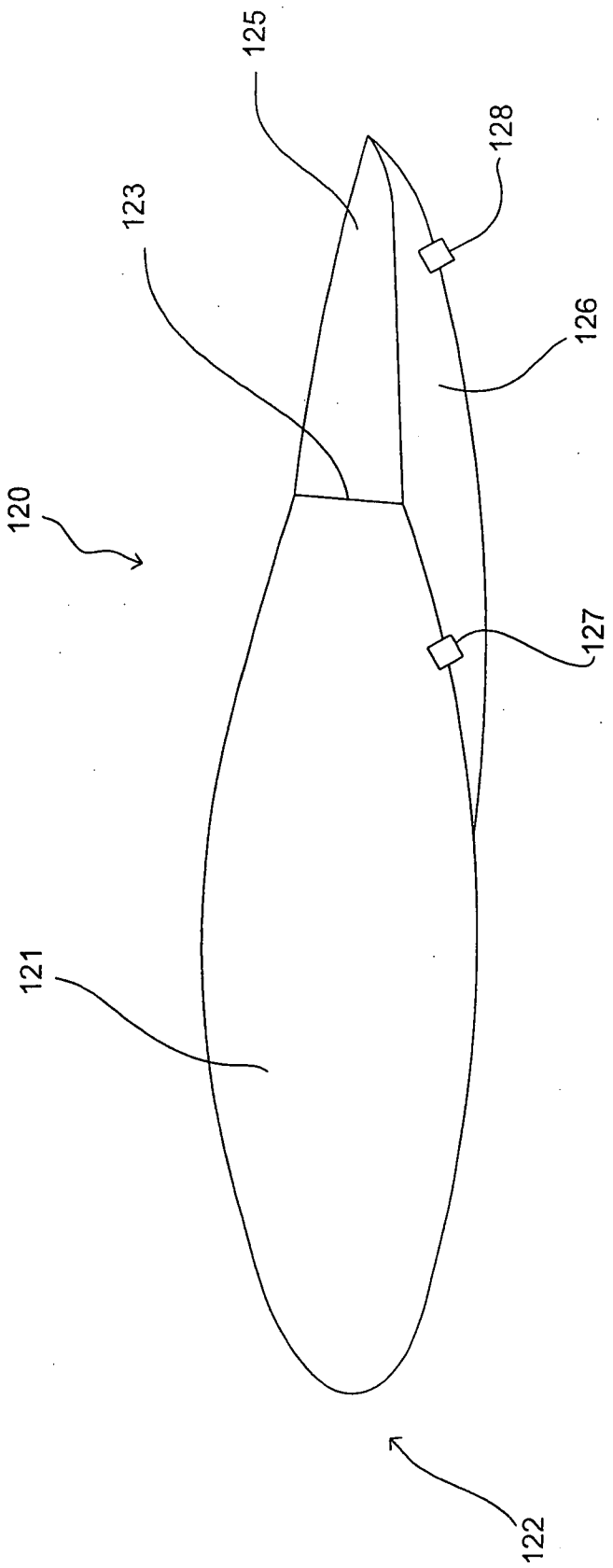


Figure 21

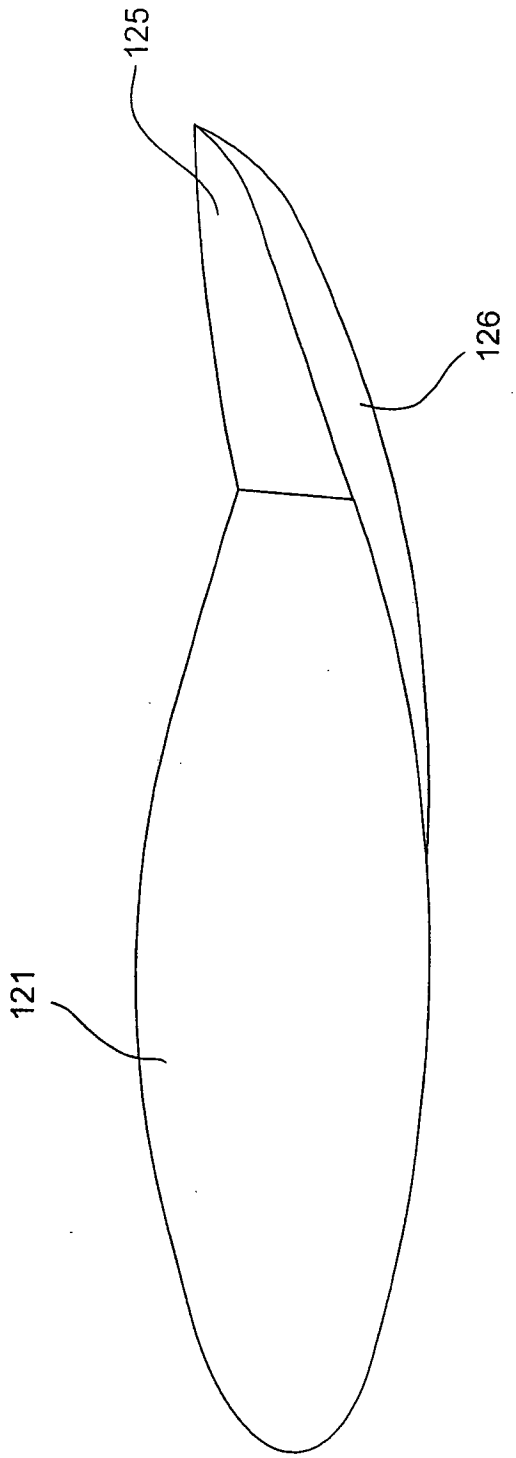


Figure 21A

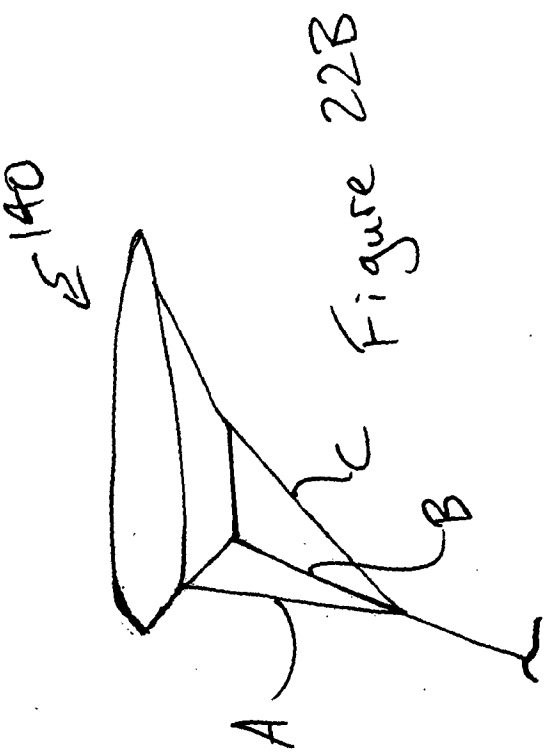


Figure 22B

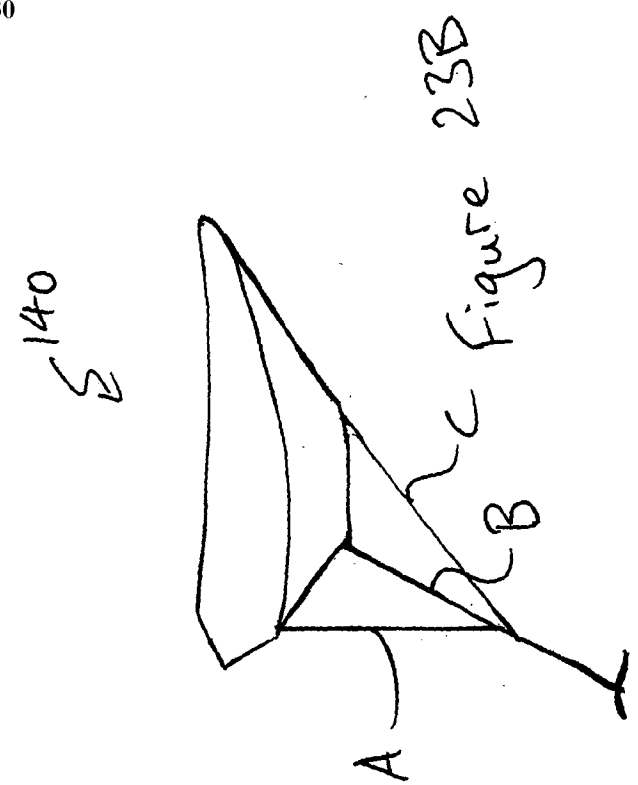


Figure 23B

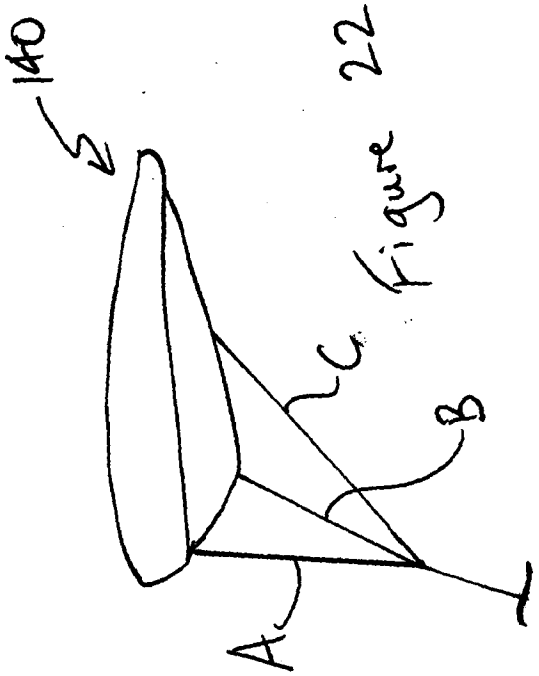


Figure 22A

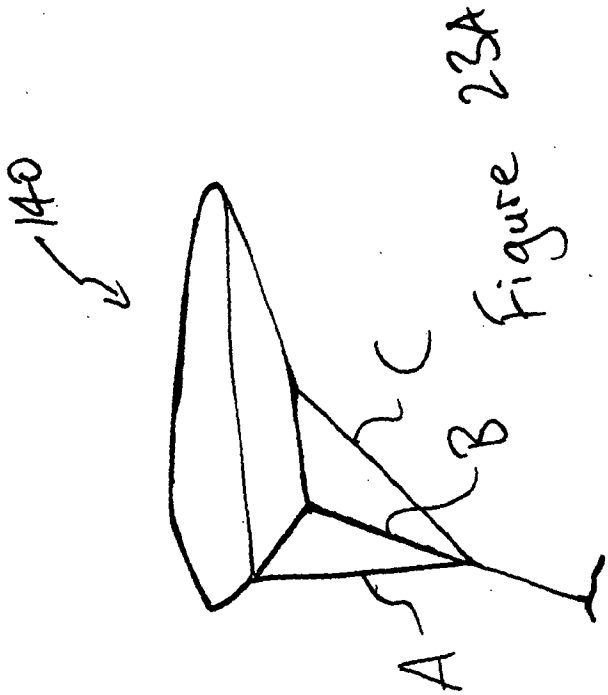


Figure 23A

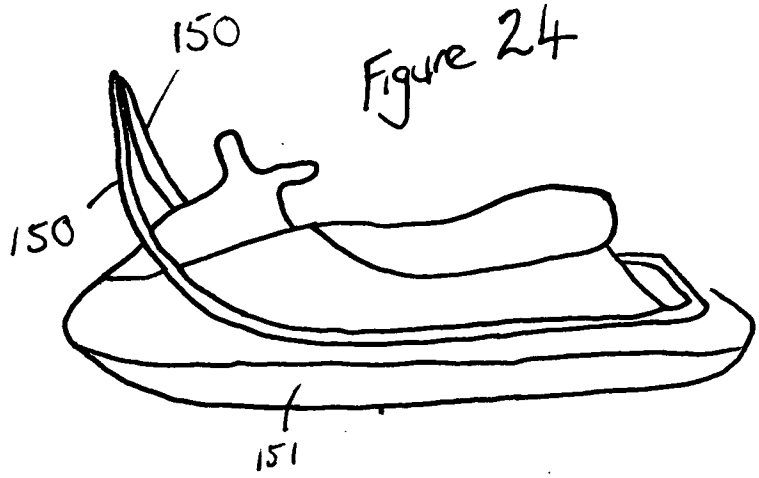
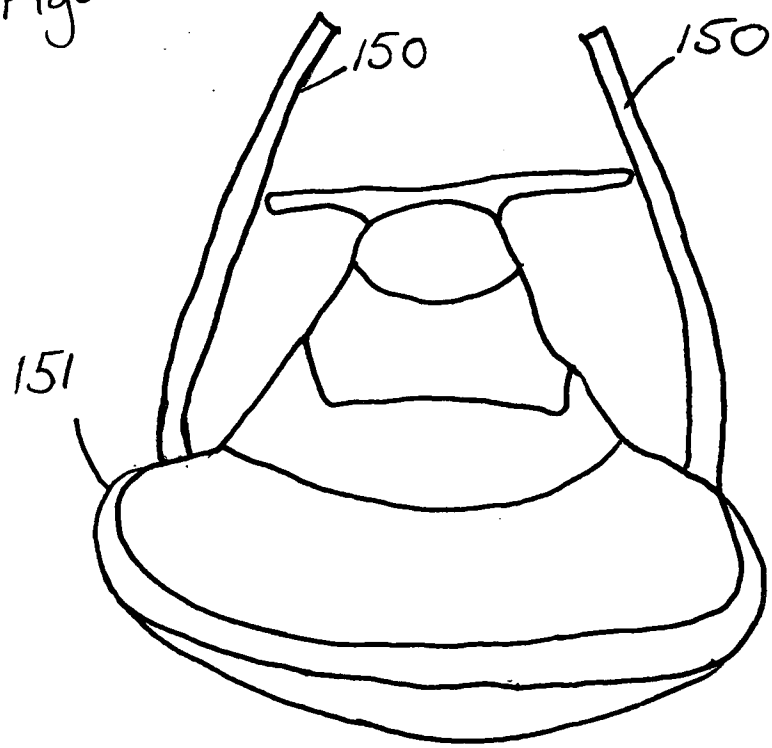


Figure 24

Figure 24A



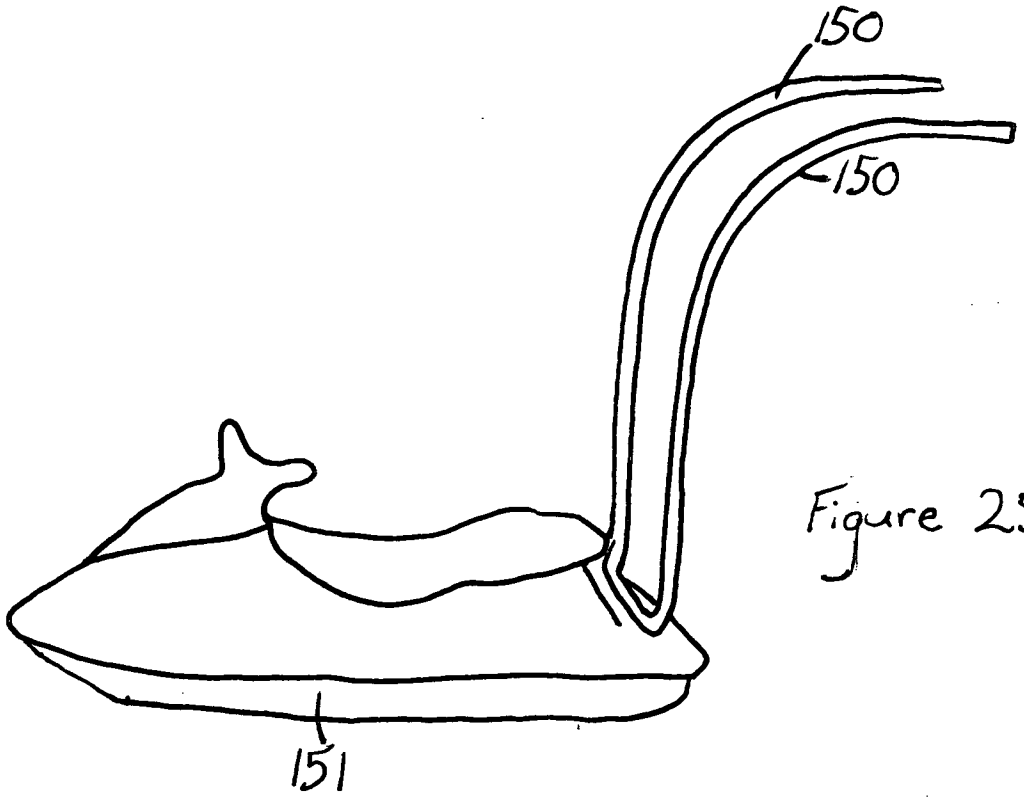


Figure 25

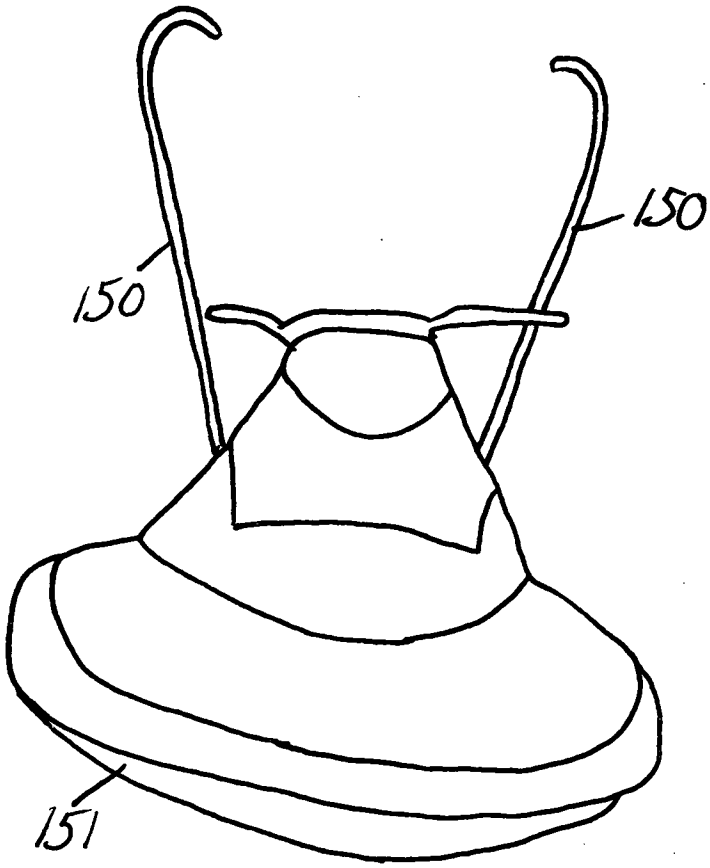


Figure 25A

Figure 26

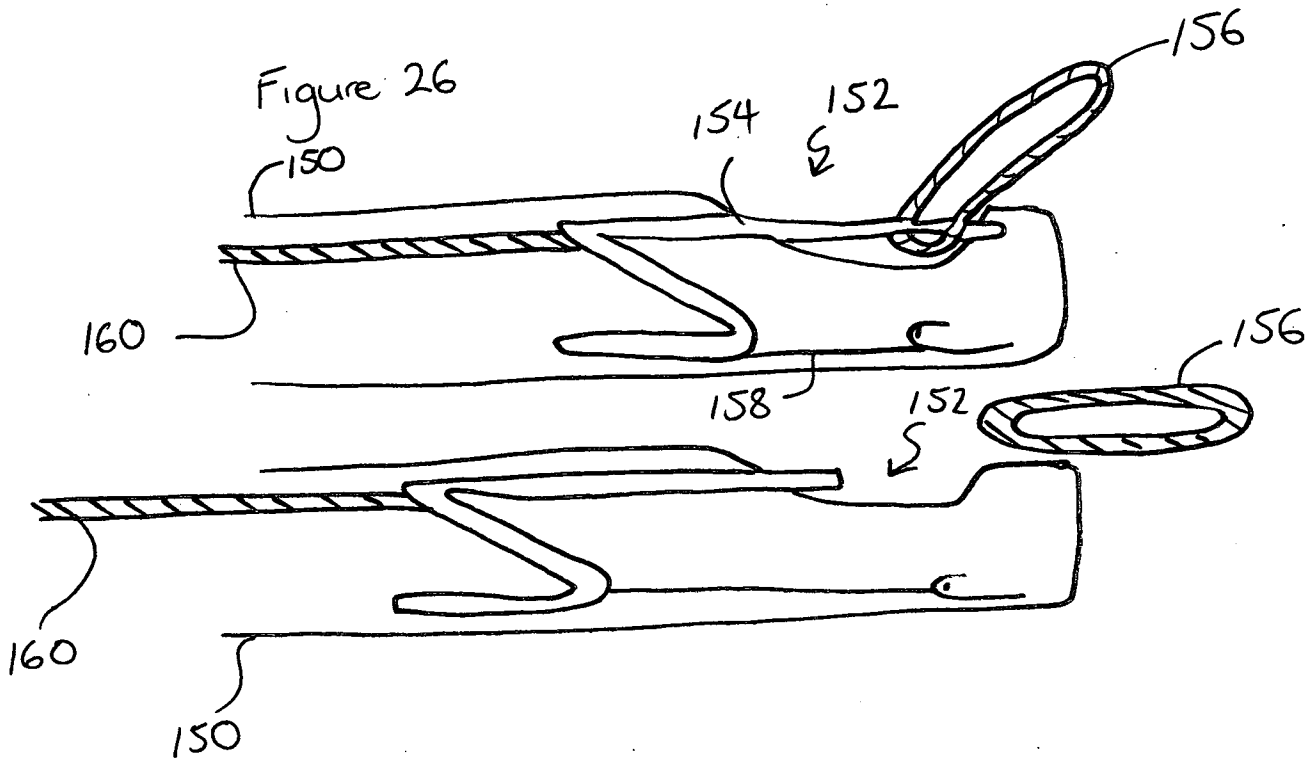


Figure 26A

Figure 27

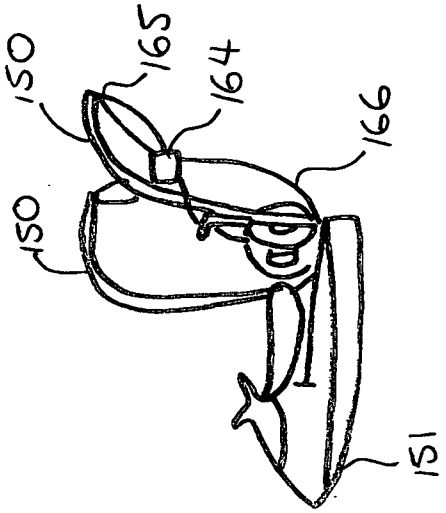


Figure 28

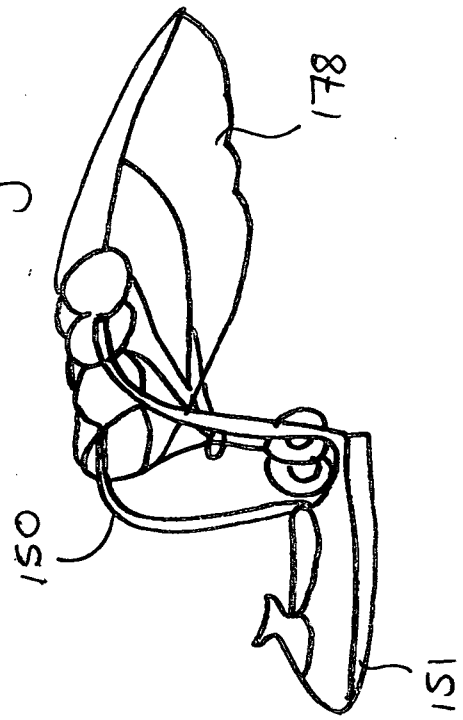
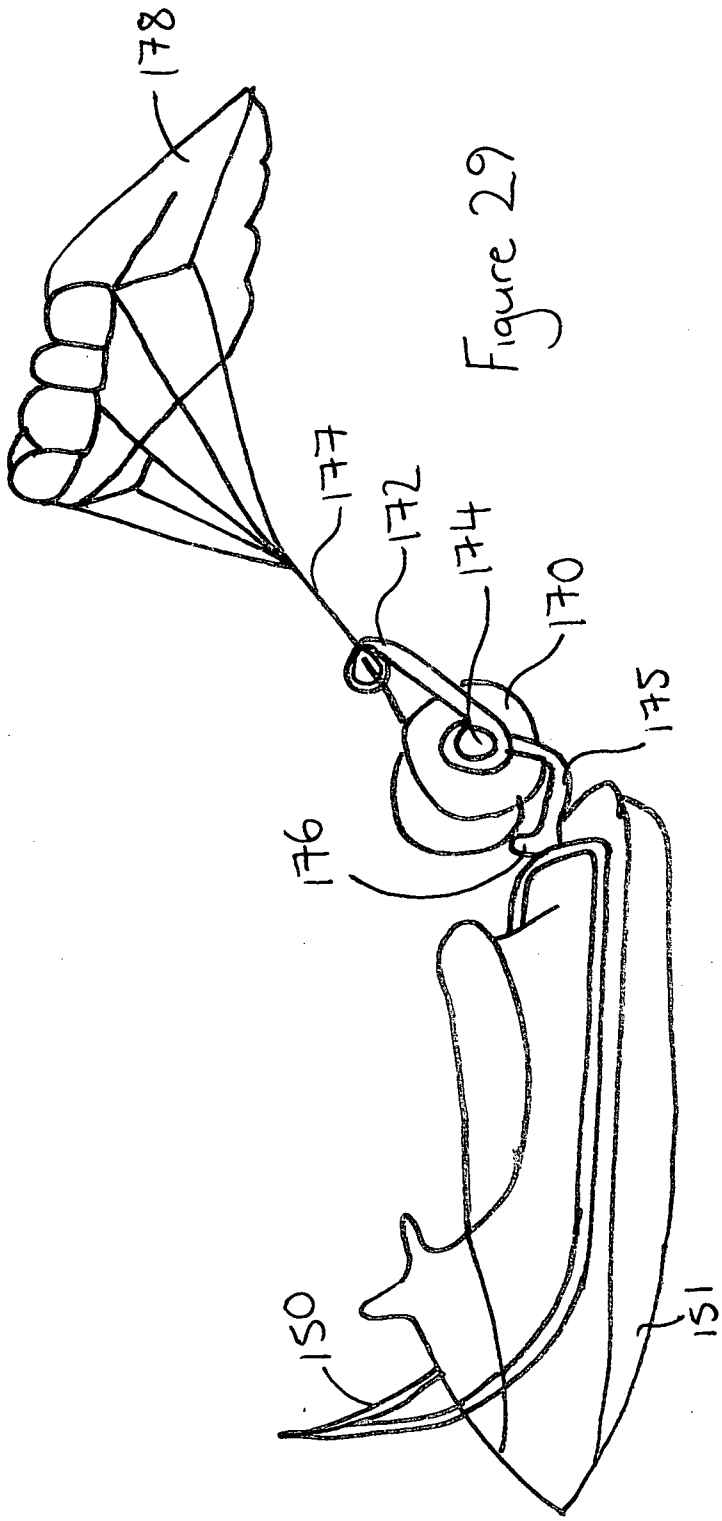


Figure 29



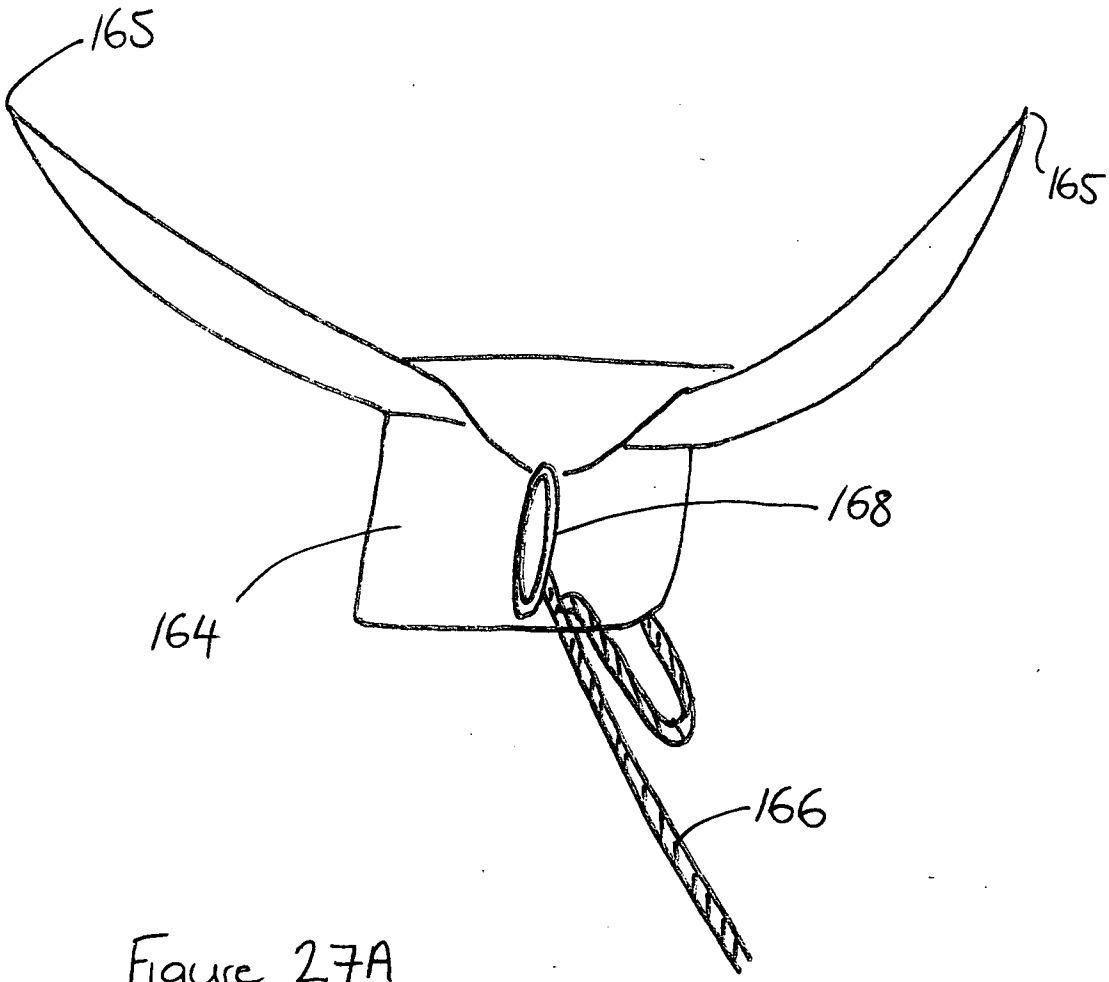


Figure 27A

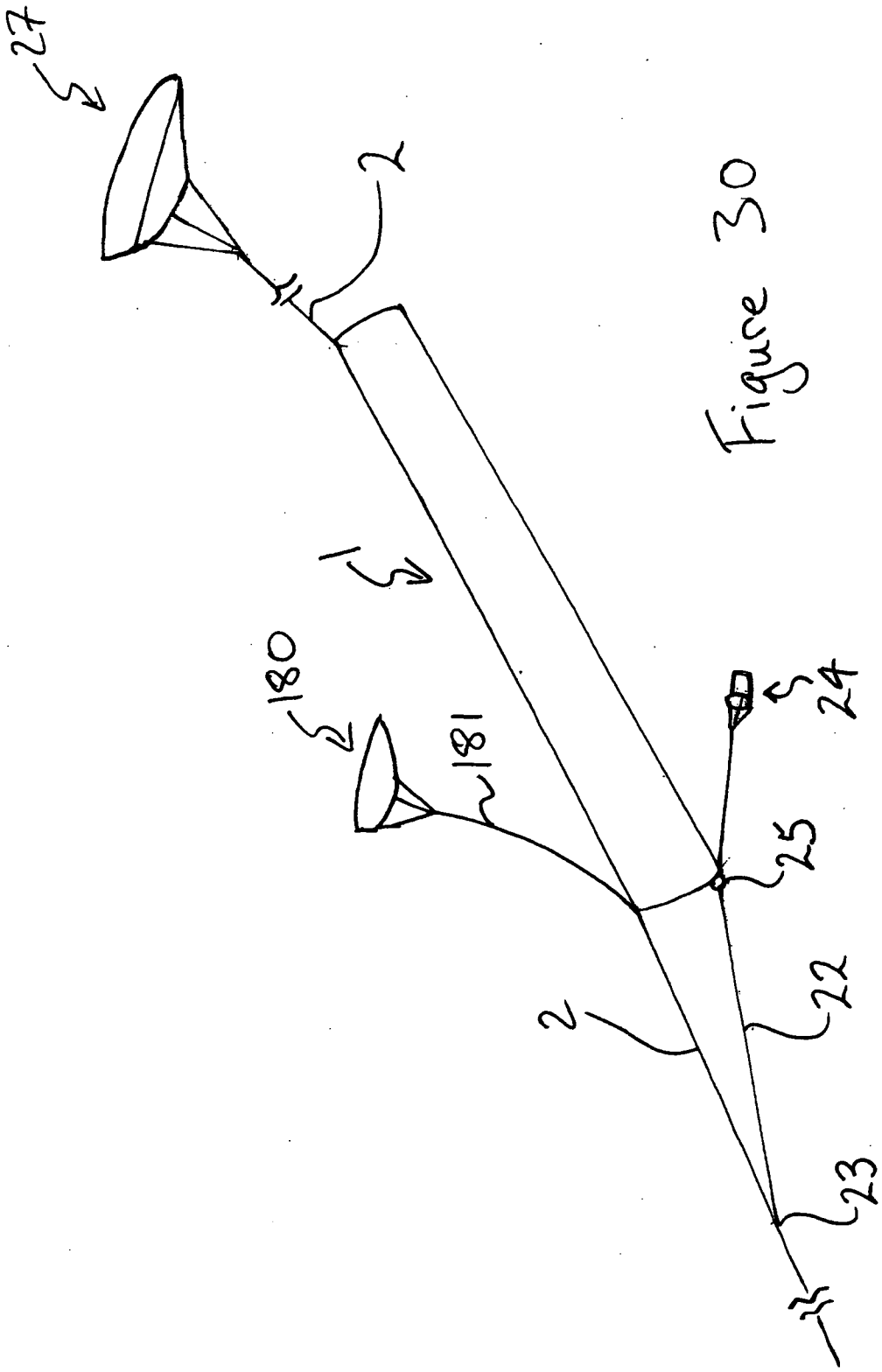


Figure 30

Figure 31

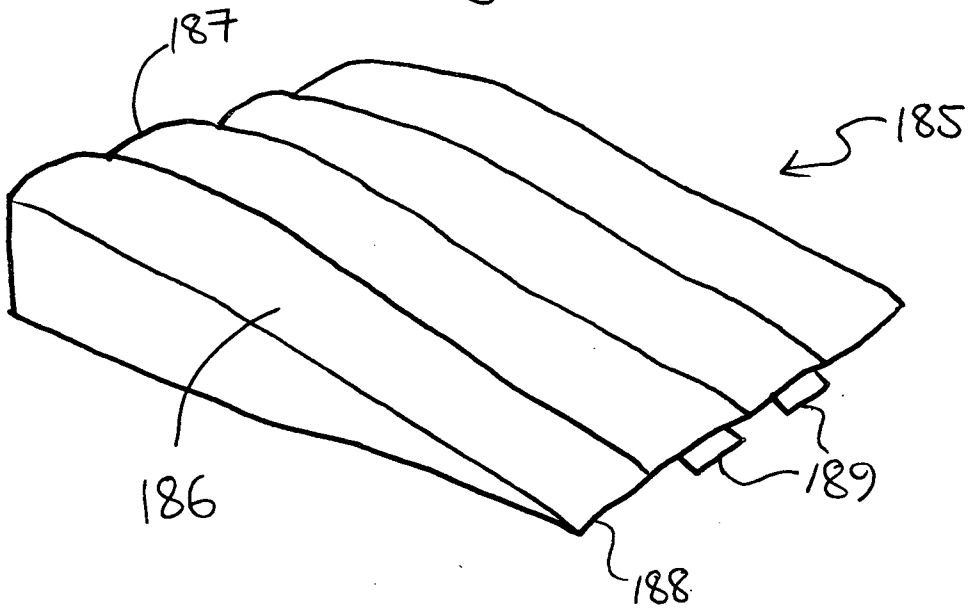


Figure 32

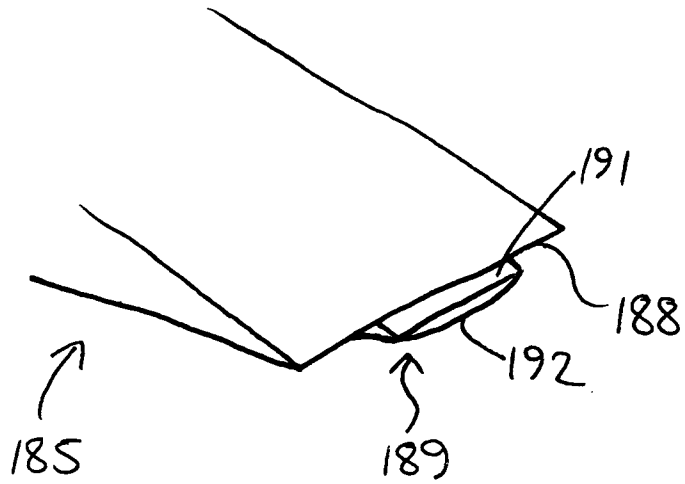


Figure 32A

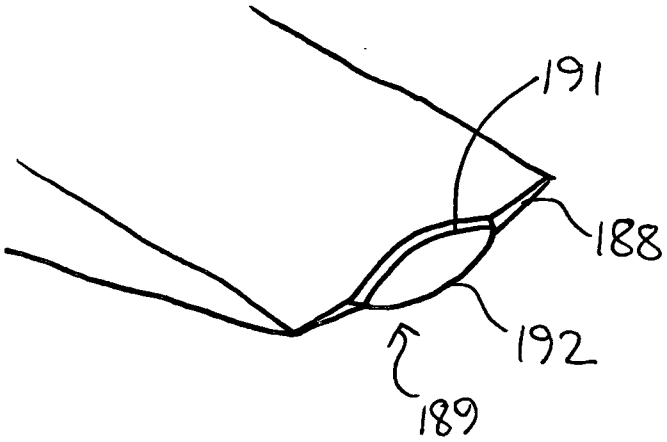


Figure 33

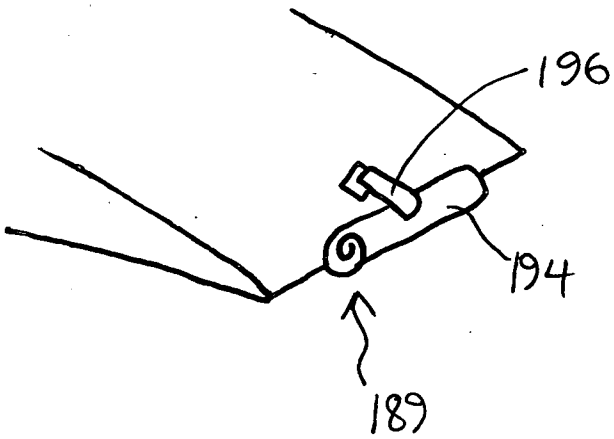


Figure 33A

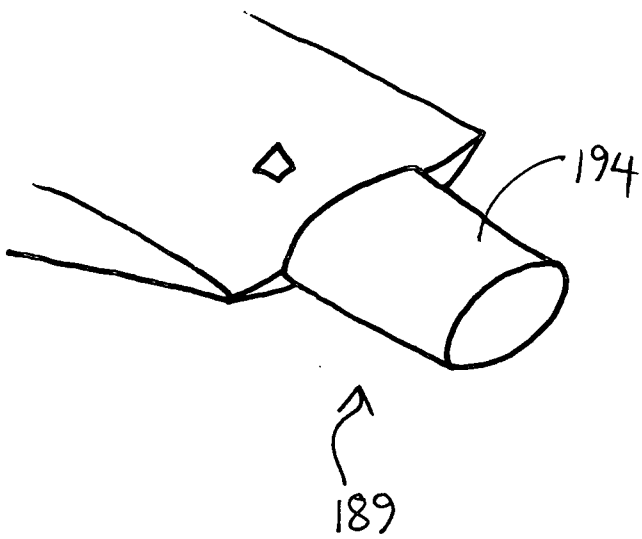


Figure 34.

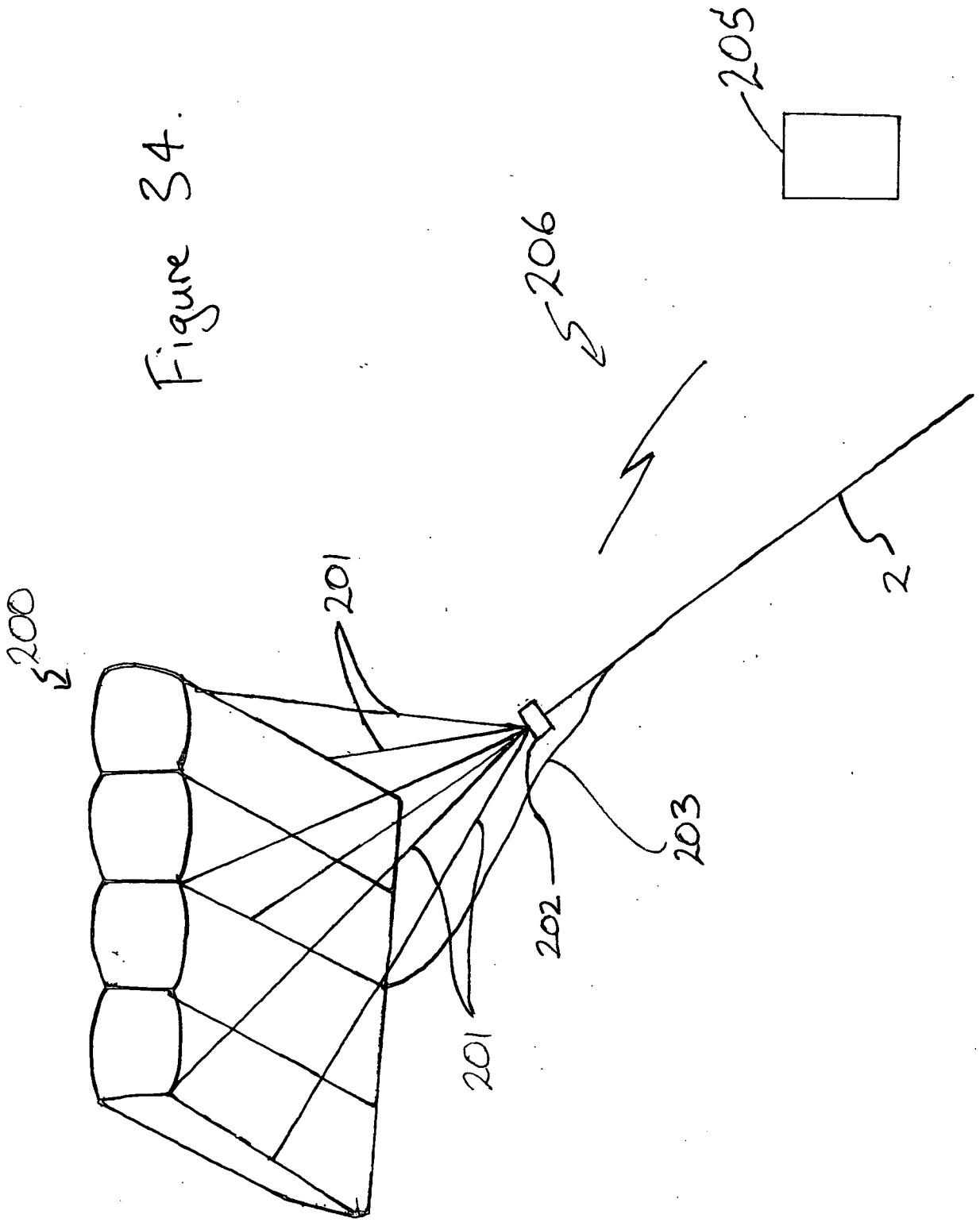


Figure 35

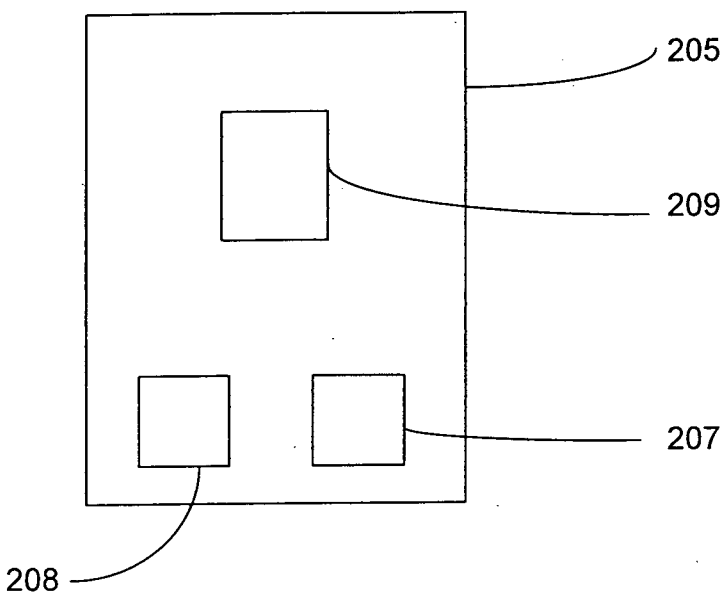
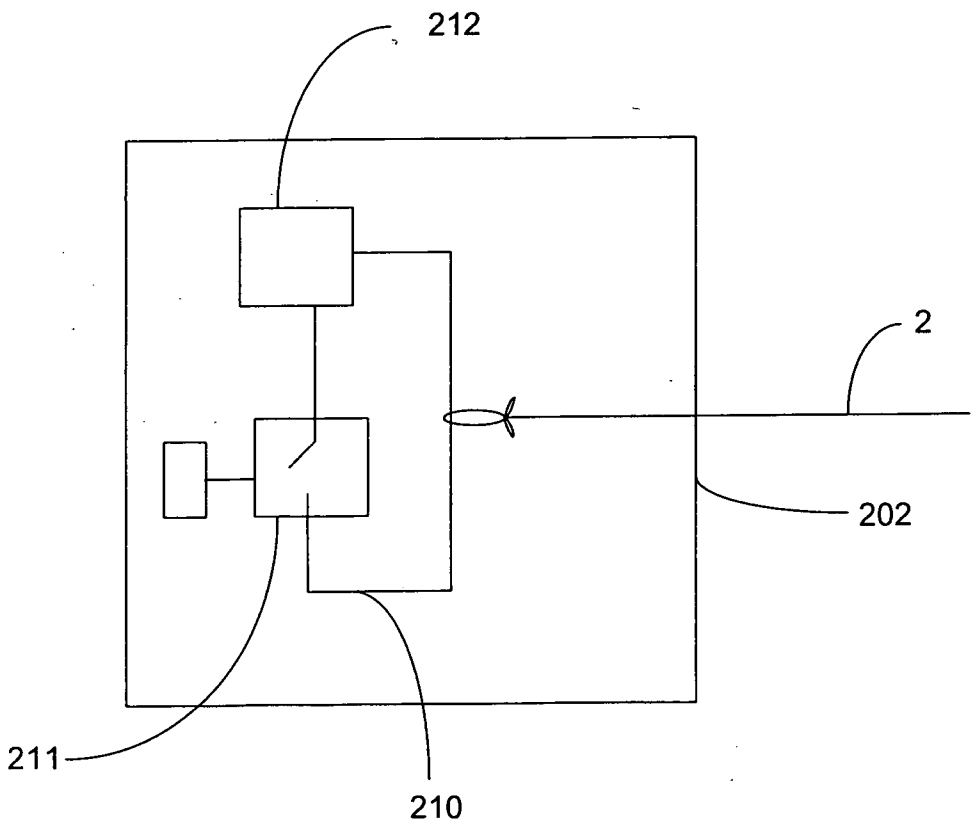


Figure 36



INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2010/000092

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

B64C 31/06 (2006.01) *G09F 21/12* (2006.01)

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)

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)
WPI, EPODOC, GOOGLE (kite, fly, line, advert, banner, promo, display, character, contain, bag, holder, free, deploy, releas etc)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, Y	GB 420465 A (DU PONT), 3 December 1934 Figures 1-2, page 1 lines 34-55, page 2 lines 58-80	1, 3-8, 10-14 2
X, Y	GB 463196 A (RANGABE), 23 March 1937 Figure 2, page 1 lines 28-76	13-14 2
X	GB 332128 A (BLERIOT), 17 July 1930 Page 2 line 76-page 3 line 44	17-22
X, Y	GB 555542 A (WHEELWRIGHT), 27 August 1943 Figure 7, page 1 lines 42-54	22, 26, 28-29 23-25

[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
03 August 2010	19 AUG 2010
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **ADRIAN GILLMORE** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2215

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2010/000092

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2098950 A (BRITISH PETROLEUM CO PLC), 1 December 1982 Figure 1	23-25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2010/000092

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search 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 No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
(i) 1-12 (ii) 13-16 (iii)17-29 (iv) 30-31 (v) 32-48 (vi) 49-51 (vii) 52 (viii) 53-71 and 107-110 (ix) 72-81 (x) 82-95 (xi) 96-106

(Continued in Supplemental Box 1)

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 additional fees, this Authority did not invite payment of additional fees.
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.:
1-29

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Supplemental Box 1
(To be used when the space in any of Boxes I to IV is not sufficient)

Continuation of Box No: III

This International Application does not comply with the requirements of unity of invention because it does not relate to one invention or to a group of inventions so linked as to form a single general inventive concept. In assessing whether there is more than one invention claimed, I have given consideration to those features which can be considered to potentially distinguish the claimed combination of features from the prior art. Where different claims have different distinguishing features they define different inventions.

This International Searching Authority has found that there are different inventions as follows:

• Claims 1-12 are directed to a banner system mounted on a flying line with individual display components attached to the line at their top edge and a means of wind resistance at the leading edge of the banner. It is considered that *individual display components attached to the line at their top edge and a means of wind resistance at the leading edge of the banner* comprises a first distinguishing feature.

• Claims 13-16 are directed to banner system mounted on a flying line with a primary lifter on the flying line and an auxiliary lifter on or near the banner. It is considered that *the auxiliary lifter on or near the banner* comprises a second distinguishing feature.

• Claims 17-29 are directed to a kite launching system where the kite container is launched into the air before the kite is released. It is considered that *the kite being released in mid-air* comprises a third distinguishing feature.

• Claims 30-31 are directed to a launching skirt for an aerodynamic object with a leading edge maintained above the water and the skirt sitting on the surface of the water behind a boat.. It is considered that *a leading edge maintained above the water and the skirt sitting on the surface of the water behind a boat* comprises a fourth distinguishing feature.

• Claims 32-48 are directed to steerable kite with a plurality of bridle lines, some of which are steering lines. It is considered that *a plurality of bridle lines, some of which are steering lines* comprises a fifth distinguishing feature.

• Claims 49-51 are directed to an attachment system for an aerodynamic object including a strut connected at 2 points to the vehicle and a slider attached to the strut and a flying line which is attached to the object. It is considered that *a slider attached to a strut and a flying line* comprises a sixth distinguishing feature.

• Claim 52 is directed to a kite with 5 or less bridle lines positioned at or near the kite's leading edge. It is considered that *a kite with 5 or less bridle lines positioned at or near the kite's leading edge* comprises a seventh distinguishing feature.

• Claims 53-71 and 107-110 are directed to an aerodynamic object with a valve to regulate the internal pressure of the object. It is considered that *an aerodynamic object with a valve to regulate the internal pressure of the object* comprises a eighth distinguishing feature.

• Claims 72-81 are directed to a launch arrangement for an aerodynamic object with launch members that can be retracted to allow the object to be attached and extended to allow launch of the object. It is considered *that launch members that can be retracted to allow the object to be attached and extended to allow launch of the object* comprises a ninth distinguishing feature.

• Claims 82-95 are directed to an attachment system comprising a winch with a first and second axis of rotation. It is considered that *a winch with a first and second axis of rotation* comprises a tenth distinguishing feature.

(Continued in Supplemental Box 2)

Supplemental Box 2
(To be used when the space in any of Boxes I to VIII is not sufficient)

Continuation of Supplemental Box No: 1

• Claims 96-106 are directed to release control mechanism for an aerodynamic object which can be activated to release or sever lines connected to the object. It is considered that *a release control mechanism which releases or severs lines attached to the object* comprises an eleventh distinguishing feature.

PCT Rule 13.2, first sentence, states that unity of invention is only fulfilled when there is a technical relationship among the claimed inventions involving one or more of the same or corresponding special technical features. PCT Rule 13.2, second sentence, defines a special technical feature as a feature which makes a contribution over the prior art.

Each of the abovementioned groups of claims has a different distinguishing feature and they do not share any feature which could satisfy the requirement for being a special technical feature. Because there is no common special technical feature it follows that there is no technical relationship between the identified inventions. Therefore the claims do not satisfy the requirement of unity of invention *a priori*.

However, it is considered that claims 1-29 can be searched as a group without too much additional effort. Claims 49-51, 72-106 can also be searched as a group without too much additional effort. Therefore the different inventions for searching purposes are:

Invention 1: Claims 1-29

Invention 2: Claims 30-31

Invention 3: Claims 32-48

Invention 4: Claims 49-51 and 72-106

Invention 5: Claim 52

Invention 6: Claim 53-71 and 107-110

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/NZ2010/000092

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
GB 420465	NONE
GB 463196	NONE
GB 332128	NONE
GB 555542	NONE
GB 2098950	DE 3219061 GR 75484 SE 8203192

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX