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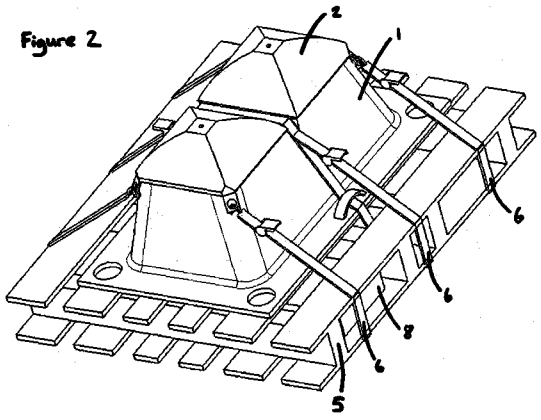
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(54) Title: APPARATUS AND METHOD

Figure 2.



(57) Abstract: Apparatus for use in delivering goods comprises a protective housing (1) for containing the goods, a transportation base (5) serving to facilitate delivery of the housing (1) and the goods therein, a releasable strap connection (6) between the base (5) and the housing (1) and a cover (2) held down by the connection (6) to restrain the housing (1) and the goods therein.

APPARATUS AND METHOD

This invention relates to apparatus for use in, and a method of , delivering goods.

Pallet-based systems are used extensively in a variety of applications for the purpose of transporting goods. However, conventional systems fail to offer the contents of the pallet any protection from the environment other than a polythene wrap. This is both time consuming and unreliable as this fails to offer a water-and weather-proof system. In some military applications pallets are frequently deployed from moving aircraft, but the lack of an environmental protection feature limits the deployment of these pallets. This is particularly an issue when trying to deploy loads into areas with extensive water masses, either as a consequence of its natural landscape or following a natural disaster where extensive flooding has occurred. The latter is of particular relevance to aid agencies prevented from supplying essential aid following a natural disaster.

EP-A-1852361 discloses a flexible waterproof flood protection container for protecting possessions from flood water. The container comprises a variable volume housing into which possessions can be placed and which can be water tightly sealed; means for stabilising the sealed housing when subjected to flood water, and two or more one-way valves for discharging air from the housing. The in use stabilising means defines two or more cavities in the housing as the interior volume of the housing increases. The cavities stabilise the housing when buoyant in flood water. The two or more one-way valves discharge air from the cavities, each one-way valve in use being in direct communication with one of the cavities defined by the stabilizing means. Owing to the variable volume housing, when the housing is subjected to external pressure, the housing at least partially conforms to the possessions therein. Preferably, the housing has at least an expandable base by which the volume of the housing varies in use. The stabilising means includes a stabilising sheet which comprises a flexible sheet body formed from a resilient air permeable material, and a plurality of anchoring straps which extend from the sheet body through stabilising sheet locating elements provided on the housing. The stabilising sheet is separable from the housing, and the sheet body covers the air valves. However, since the sheet body is air permeable, the

discharge of air through the air valves is not restricted. Four of the anchoring straps are provided at respective corners of the sheet body, and a single middle strap of greater length than the corner straps is provided substantially midway between the air valves and bisecting the longitudinal extent of the housing 12.

According to one aspect of the present invention, there is provided apparatus for use in delivering goods, comprising a housing for containing the goods, and a feature serving to facilitate delivery of the housing and the goods therein.

According to another aspect of the present invention, there is provided a method comprising facilitating delivering of apparatus comprising a housing with goods contained therein.

Owing to the invention, goods can be delivered more reliably and safely, especially in difficult circumstances.

Preferably, the present system is designed to protect its contents from the effects of contaminants, such as water, when the system is deployed from a stationary or moving vehicle, such as a plane, lorry or ship. The system can be designed to work in conjunction with standard or bespoke pallet systems that are currently used in commercial and military applications.

In an embodiment of the invention, the system provides a means to keep the contents together, ensuring that their movement is restricted and that they act as a single mass during transportation, deployment, touchdown and recovery. This condition is important in reducing the movement that would cause objects to expose corners or edges that may puncture the housing. The housing may be constructed of a water-/air-tight liner that is accessible via a sealable opening. An important feature of the liner is the incorporation of one or more pressure relief valves to prevent damaging pressure build-ups on touchdown. The liner also facilitates the incorporation of buoyancy aids to prevent the system from being negatively buoyant and sinking.

The housing may sit on a transportation base or pallet, which incorporates an impact reduction feature, such as corrugated cardboard, to absorb some of the forces on impact with the ground or water. The housing sits on the pallet and the goods are placed within the housing through either a single aperture or multiple

apertures which are sealed after placement; after sealing, the housing forms a water-/air-tight container.. The container is compressed around the goods through all axes by a system that can evacuate the air so as to keep the contents compressed into a single mass and therefore substantially immovable even if the contents comprise many stacked containers. The incorporation of at least one pressure relief valve in the liner allows the trapped air to escape and prevent damage occurring to the liner and at the same time create the state of a single encapsulated mass. An alternative method for evacuating the air is by the use of a valve attached to and extending through the liner, and a vacuum pump. The water-/air-tight container and its contents may be restrained by an outer protective bag or cover that can allow delivery systems, such as a parachute, to be attached and can constrain the liner to the pallet or base. This outer protective bag or cover may also comprise a means, frequently long straps, for use in recovering the system and its goods. Such an outer protective bag may comprise an outer thermal jacket to protect the contents against extremes of temperature, such as fire. As an example, the contents may be pharmaceuticals to be protected against extreme heat or cold.

Furthermore, the system may incorporate a base plate that can be caused to break away either at the point of deployment or on contacting water, by means of a sensor which deactivates a latch. The base plate, which is negatively buoyant, is tethered to the upper part of the base or pallet, from one point or multiple points, in such a way that, in water, it would submerge and provide a stability aid to the housing and its contents and ensure that the system remains floating in the correct orientation and anchored at a stable position. The base plate need not anchor to the bottom, it may be sufficient that it should function as a sea anchor.

Moreover, the base plate and the bottom section of the housing may be attached together to form a single assembly, or may be integral with each other, with additional access points in them for loading and unloading of the contents.

In a further possibility, the features contained in the outer protective bag or cover that can allow delivery systems, such as a parachute, to be attached and can constrain the liner to the pallet or base and can allow recovery of the container, may instead be incorporated onto the water-/air-tight container.

The system may contain a homing beacon that is permanently deployed, or deployed via a sensor and latch when the base comes into contact with water, or deployed remotely by a wireless signal, to aid the recovery of the apparatus where it is used with contents that would cause the apparatus to submerge.

A gas supply, typically a compressed CO_2 cylinder, may be used to provide buoyancy to the liner. The cylinder may be activated on command by using a transmitter and receiver to re-float the apparatus and its contents after submersion, or automatically by utilising a sensor that is activated on contact with water. The same cylinder can, in conjunction with a valve block, pendulum sensor and flotation chambers incorporated into the apparatus, distribute air to specific chambers to provide buoyancy stability, thus keeping the apparatus floating in a desired orientation.

In order that the invention may be clearly and completely disclosed, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 shows a perspective view from above of apparatus for use in delivering goods;

Figure 2 is a view similar to Figure 1, but of a first modified version of the apparatus;

Figure 3A is a perspective view of a second modified version of the apparatus shortly after it has been deployed from an aeroplane;

Figure 3B is an elevation of that second modified version after it has fallen onto water, for example a lake;

Figure 4 is a view similar to Figure 3B but of a third modified version of the apparatus;

Figure 5 is an elevation of a fourth modified version of the apparatus;

Figure 6 is an exploded perspective view of a fifth modified version of the apparatus;

Figure 7 is an elevation of a sixth modified version of the apparatus;

Figure 8 is an elevation of that sixth version after deployment from an

aeroplane;

Figure 9 is an elevation of a seventh modified version of the apparatus after deployment from an aeroplane;

Figure 9A is an elevation of that seventh version afloat and carrying a heavy load; and

Figure 9B is a view similar to Figure 8A, but with that seventh version carrying a light load.

Referring to the drawings in general, a goods delivery environmental protection system will be described which provides in this instance a water-tight environment/container that can be used for the delivery of goods from a hovering or moving aircraft into water, or similar such applications that require goods to be protected from the environment that they are being delivered into, whereby they require water-tight protection, possibly with a temperature-control device for the interior of the container, for example where the goods are medical preparations.

Referring particularly to Figure 1, there is seen a flexible waterproof and/or airtight container 1 with contents (not shown) prior to evacuation of the air. A sealable access opening is positioned below an outer protective cover 2. The outer protective cover 2 is normally of a breathable material to allow air trapped between the cover 2 and the container 1 to escape, and has tether straps 4 for constraining the container 1 to either a transportation pallet or another form of base, to aid recovery. Two pressure relief valves which are embodied into the container 1 exhaust via apertures 3 in the protective cover 2. It will be appreciated that what is described with reference to Figure 1 is very similar to what is described in EP-A-1,852,361, the disclosure in which is incorporated herein.

Referring to Figure 2, a container 1 of water-/air-tight material and its protective cover 2 are fixed to a wooden transportation pallet 5 as used by the military or aid agencies to transport equipment or provisions. In this example, standard ratchet straps 6 are used to constrain the goods-containing liner l and the cover 2 to the pallet. In other examples, alternative constraint methods can be used that facilitate automatic deployment of the container 1 and goods when the pallet 5 comes into contact with the water by means of a sensor that would de-activate a latch, thus releasing the pallet 5. Where the pallet 5 is negatively

buoyant and used in conjunction with a tether, the pallet 5 would sink and provide a stability aid to the container 1. Contained within the pallet 5 is a sealed unit 8, consisting of a gas cylinder, an electronic control unit (ECU), and a valve block which is connected to various flotation chambers (not shown) either within the water-tight container 1 or attached to the outside. The unit 8 can, when activated, re-float or stabilise the apparatus, when the apparatus comes into contact with water.

Figure 3A shows an aeroplane 12 which has just dropped an apparatus 10 shown diagrammatically and possibly corresponding to that shown in Figure 1 or 2. Attached to the item 10 is a parachute 14 shown deploying, and a ballast weight 16 shown deployed. Figure 3B shows the item 10 afloat on the water W onto which it has been dropped, with the ballast weight 16 performing, in effect, the function of a sea anchor and tending to keep the item 10 upright and with its top out of the water. The parachute 14 is seen attached to straps 18 which facilitate recovery of the item 10 from the water and which may also be used to support the ballast weight 16.

The version shown in Figure 4 differs from that shown in Figures 3A and 3B in that the item 10 has extending around it one or more inflatable chambers 20 which are attached to the straps 18 and which maintain the apparatus afloat on the water W. It is the unit 8 (not shown in Figure 4) which performs the inflation of the chamber(s) 20.

The version shown in Figure 5 provides a relatively hard case for containing the goods to be delivered. An impact-resistant plastics box 22 is received within the water-tight container 1, which is mounted fittingly in an impact-resistant plastics pallet 24 with, around its periphery, holes 26 for receiving forks of fork-lift trucks. The items 1, 22 and 24 are held together by restraining and carrying straps 28

The version shown in Figure 6 provides a soft case for delivery of strong goods, such as ammunition-containing boxes 30. These are carried by the plastics pallet 24 and held thereon by a cargo net 32. All of the items 24, 30 and 32 are placed into a container 34 via an aperture 35 therein sealingly closable by a flap (not shown). The container 34 is in the form of a waterproof bag provided with pressure relief valves 36 and carrying and recovery straps 38 at respective

opposite sides of the container 34.

Referring to Figure 7, this version again has a waterproof bag 40 containing the goods to be delivered, but with an outer bag 42 with strap-form carrying handles 44 and with D-rings 46 therearound for connection to a parachute. The bag 40 and the carrier 42 are supported upon a pallet 24. As shown in Figure 8, the pallet 24 is connected by a tether 48 to the carrier 42. Figure 8 shows a condition in which the apparatus including the parachute 14 has just been dropped from an aircraft. After dropping of the apparatus onto the water, the pallet 24 functions as a sea anchor similarly to the ballast weight 16.

The version illustrated in Figures 9 to 9B is similar to that illustrated in Figures 7 and 8 except that it has a plurality of parachutes 14 and that there is, around the carrier 42, one or more buoyancy chambers 50 in a ring and adjustable up and down straps 52, straps 54 serving to interconnect the buoyancy chamber(s) 50 and the pallet 24. In the event that the goods to be delivered constitute a relatively heavy load, then, before the apparatus is deployed from the aircraft, the or each buoyancy chamber 50 is brought to a high level up the straps 52 relative to the container 40 and the carrier 42, as indicated in Figure 9A. On the other hand, when the goods constitute a relatively light load, the or each chamber 50 is brought to a low level relative to the container 40 and the carrier 42, as seen in Figure 9B. This feature is provided because the buoyancy chamber(s) 50 is/are less able to deter tilting of a heavy, floating load than of a light, floating load.

CLAIMS

1. Apparatus for use in delivering goods, comprising a housing for containing the goods, and a feature serving to facilitate delivery of the housing and the goods therein.

2. Apparatus according to claim 1, wherein said feature comprises a transportation base.

3. Apparatus according to claim 2 and further comprising a releasable connection between said base and said housing.

4. Apparatus according to claim 3, and further comprising a sensing device arranged to initiate release of said connection.

5. Apparatus according to any one of claims 2 to 4, wherein the arrangement is such that, following dropping said apparatus onto water, said housing floats and said base functions as an anchor.

6. Apparatus according to any one of claims 2 to 5, wherein said base includes an impact-reduction device.

7. Apparatus according to any preceding claim and further comprising, following dropping said apparatus onto water, said anchoring device functions.

8. Apparatus according to any preceding claim, wherein said feature comprises a parachute.

9. Apparatus according to any preceding claim, wherein said housing is a variable volume housing.

10. Apparatus according to claim 9, wherein said housing comprises a valve for relief of gas therein.

11. Apparatus according to any preceding claim, wherein said housing is of a character to be protective of the goods against deleterious ambient conditions.

12. Apparatus according to any preceding claim and further comprising a restraining device serving to restrain said housing and the goods therein.

13. Apparatus according to claim 12, wherein said restraining device is a bag containing said housing.

14. Apparatus according to claim 12 or 13 as appended to claim 8, wherein said parachute is arranged to be attached to said restraining device.

15. Apparatus according to any one of claims 12 to 14, wherein said restraining device further comprises a device to facilitate recovery of said apparatus.

16. Apparatus according to any preceding claim and further comprising a flotation device for supporting said apparatus in water.

17. Apparatus according to claim 16, and further comprising an adjusting arrangement whereby the level of said flotation device relative to said housing is adjustable.

18. Apparatus according to any preceding claim and further comprising a homing device.

19. Apparatus according to any preceding claim and further comprising a gas supply device operable to supply gas to said housing.

20. Apparatus according to claim 19, wherein said gas supply device is remotely activatable.

21. Apparatus according to claim 19, wherein said gas supply device is activatable automatically upon said apparatus dropping onto water.

22. Apparatus according to any one of claims 19 to 21, wherein said housing is divided into chambers and said apparatus further comprises a distributing device connected to said gas supply device and serving to distribute gas therefrom among said chambers.

23. Apparatus according to claim 22, and further comprising an orientation sensor arranged to control said distributing device and thus the distribution of the gas among the chambers.

24. Apparatus according to any preceding claim, and further comprising a temperature-controlling device associated with said housing and serving to control the temperature within said housing.

25. A method comprising facilitating delivering of apparatus comprising a

housing with goods contained therein.

26. A method according to claim 25, wherein said delivering is performed by dropping said apparatus onto water and thereafter anchoring said apparatus.

27. A method according to claim 26, wherein said anchoring is performed by a device functioning as a sea anchor.

28. A method according to any one of claims 25 to 27 and further comprising releasing a connection between said housing and a transportation base of said apparatus.

29. A method according to any one of claims 25 to 28, and further comprising adjusting, relative to said housing, the level of a flotation device of said apparatus.

30. A method according to any one of claims 25 to 29 and further comprising, after delivery of said apparatus, supplying gas to said apparatus to provide buoyancy.

31. A method according to claim 30, wherein said supplying of said gas comprises distributing said gas among a plurality of chambers of said apparatus.

32. A method according to any one of claims 25 to 31 and further comprising controlling the temperature within said housing.

33. A method according to claim 32, wherein said goods comprise medical supplies.

34. A method according to any one of claims 25 to33, wherein said goods comprise armaments.

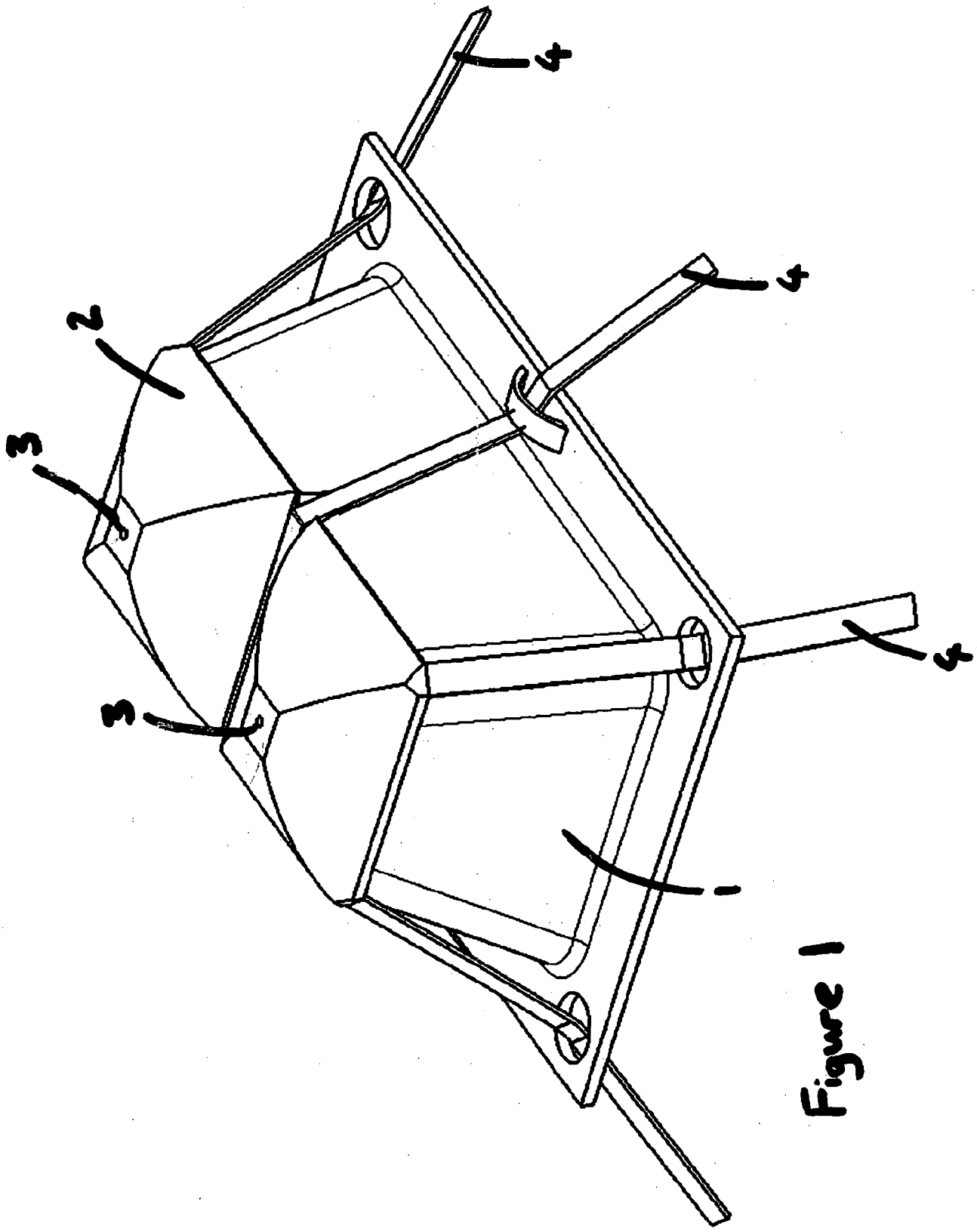


Figure 1

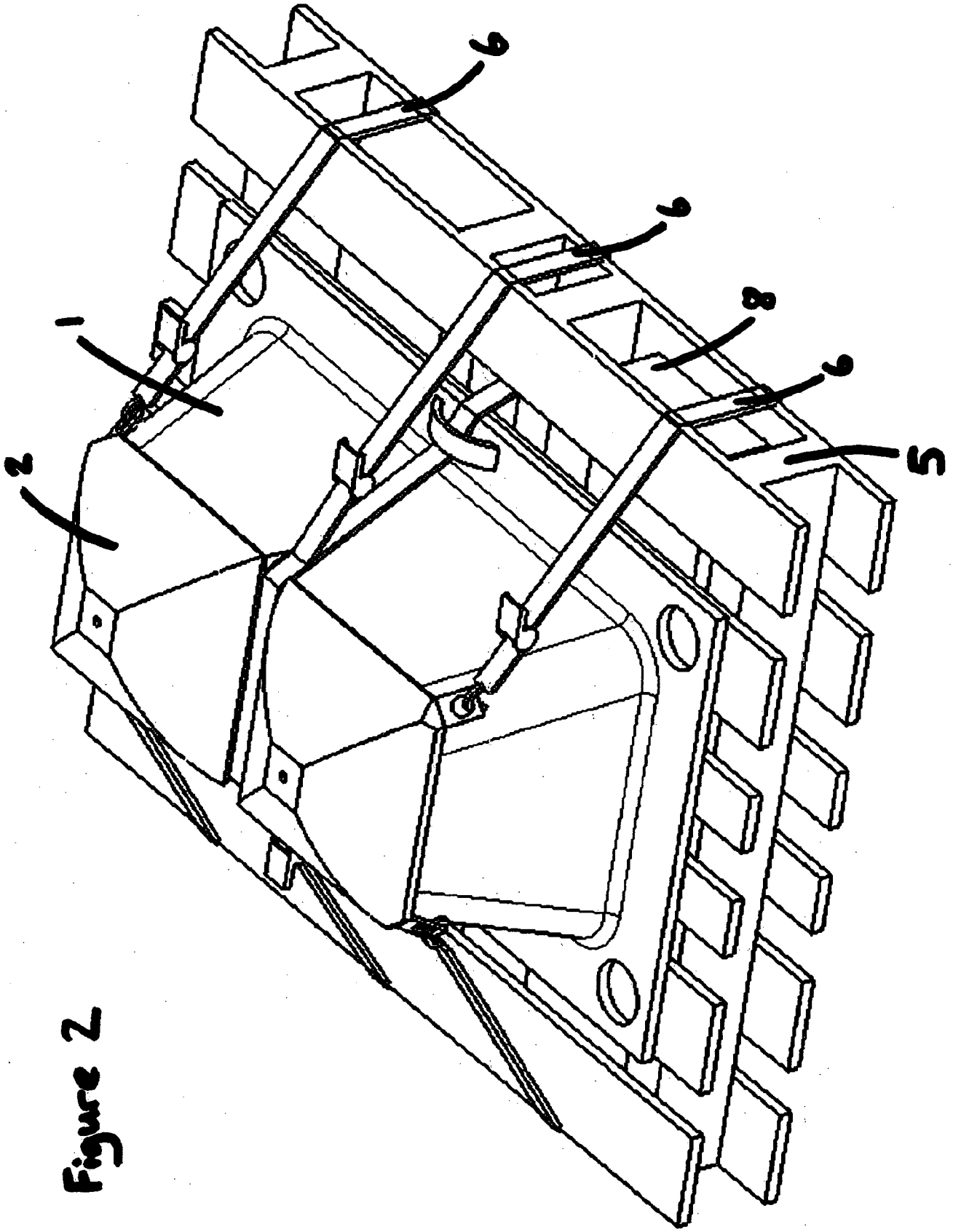


Figure 2

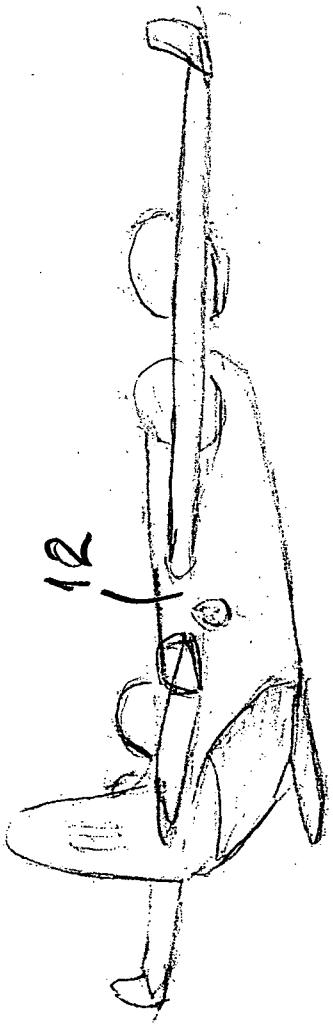


Fig.3A

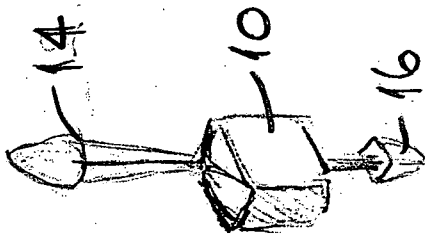
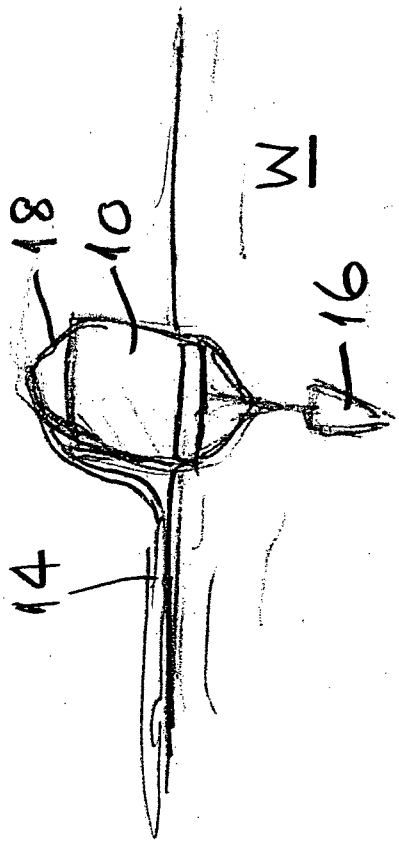


Fig.3B



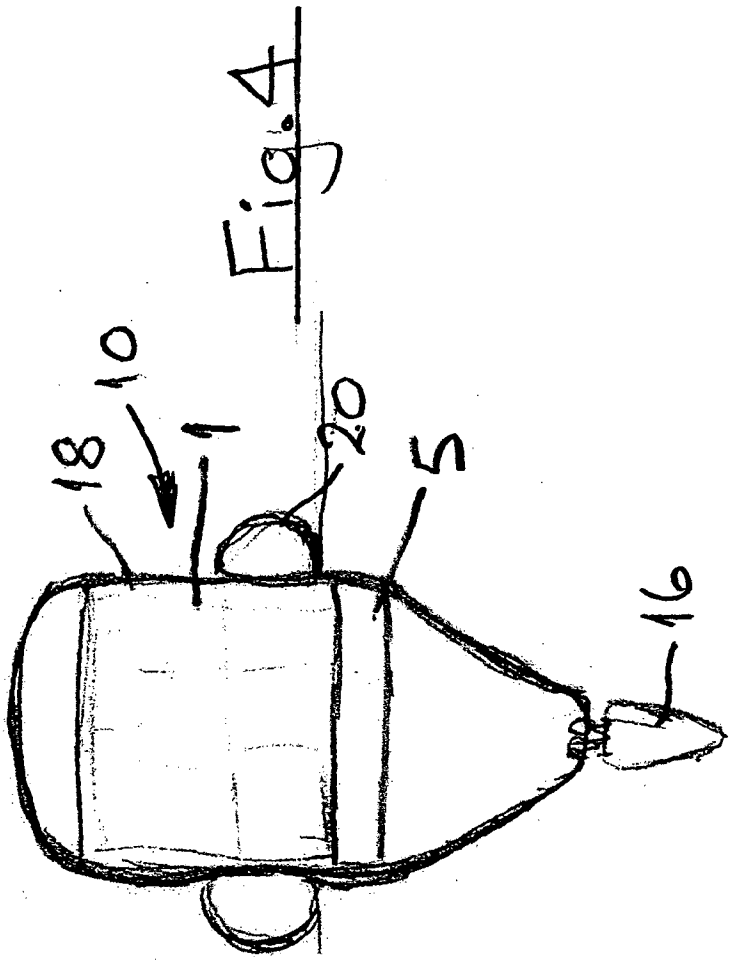


Fig. 4

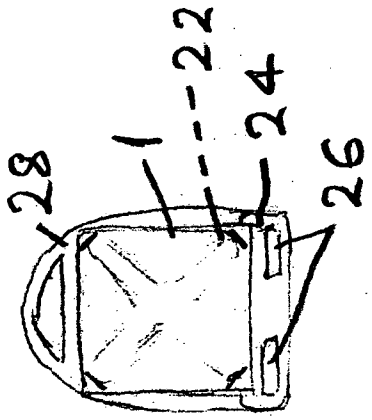


Fig. 5

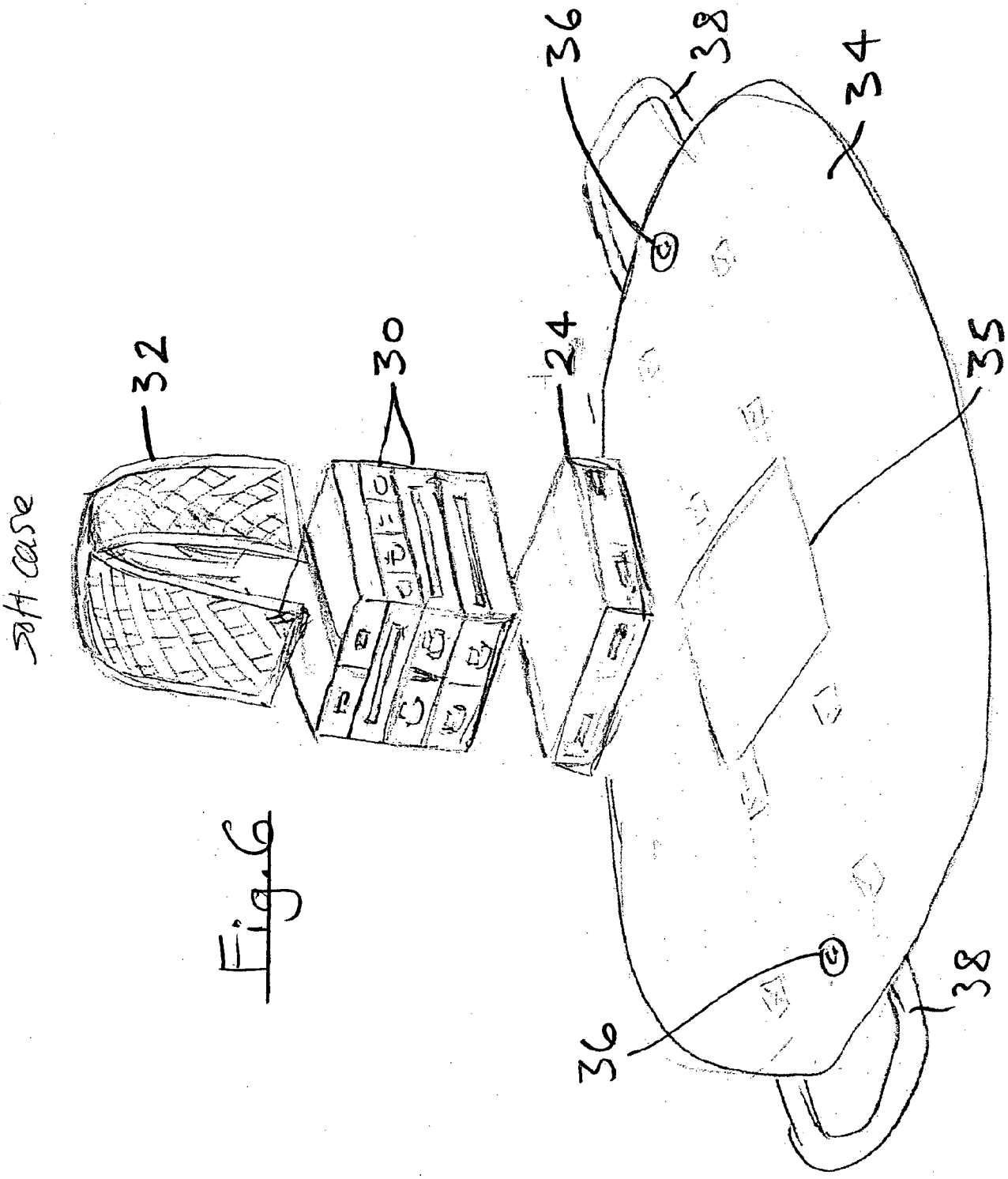
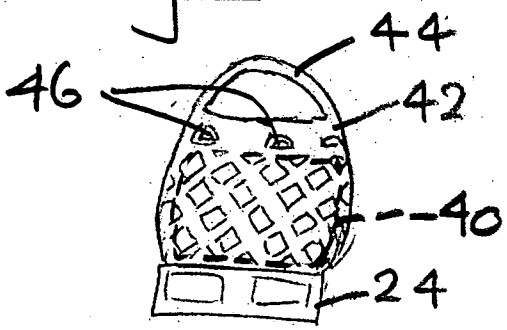


Fig 6

Fig.7



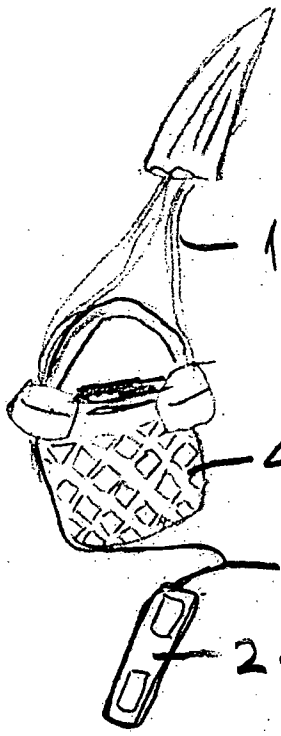
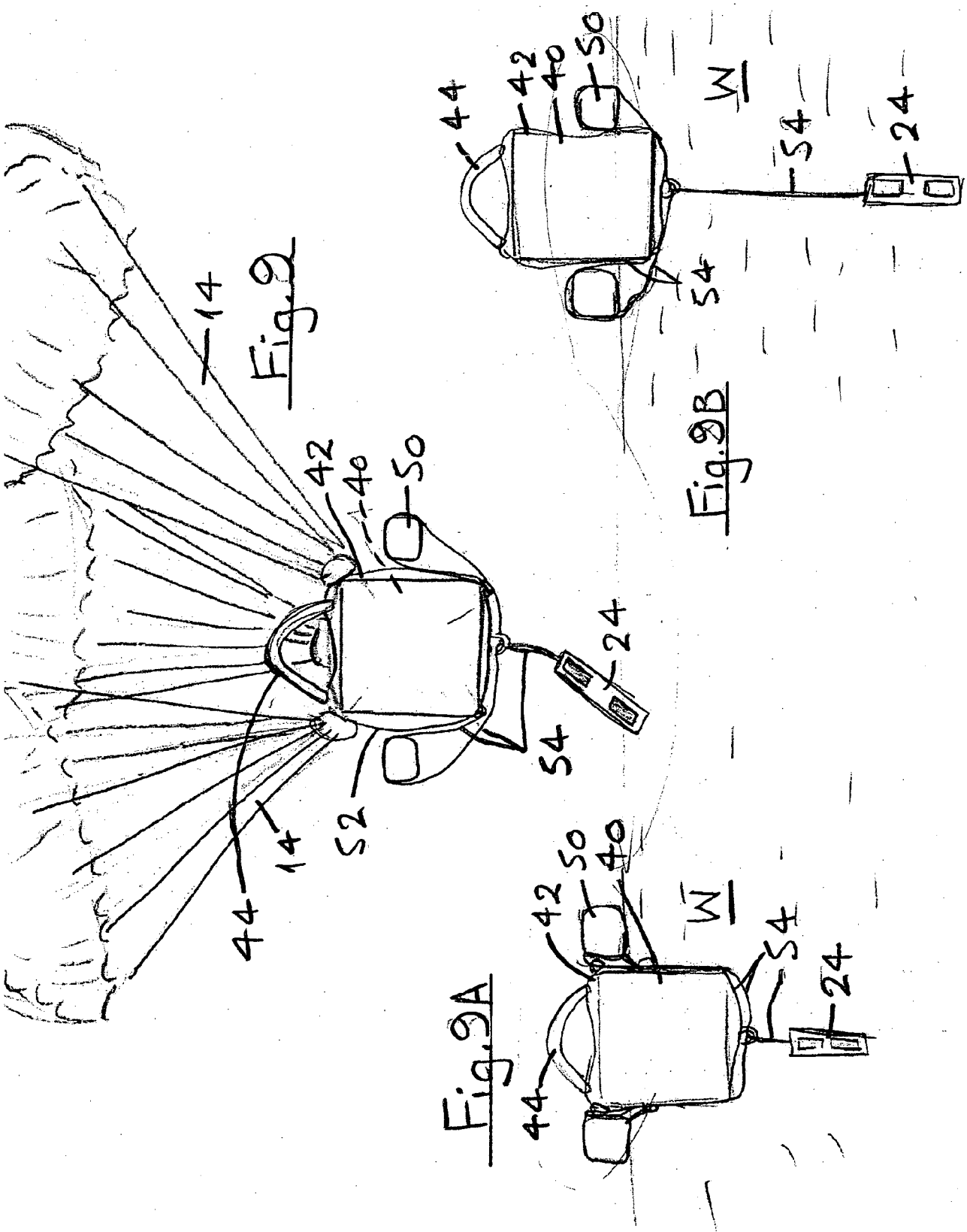


Fig.8


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W
Fig.9
Fig.9B
Fig.9A