

Serial No. 540,607
Filing Date 11 October 1995
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19960405 078

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1 Navy Case No. 76117

2
3 UNMANNED UNDERSEA VEHICLE INCLUDING KEEL-MOUNTED PAYLOAD
4 DEPLOYMENT ARRANGEMENT WITH PAYLOAD COMPARTMENT FLOODING
5 ARRANGEMENT TO MAINTAIN AXI-SYMMETRICAL MASS DISTRIBUTION

6
7 STATEMENT OF GOVERNMENT INTEREST

8 The invention described herein may be manufactured by or for
9 the Government of the United States of America for Governmental
10 purposes without the payment of any royalties thereon or
11 therefor.

12
13 CROSS-REFERENCE TO RELATED APPLICATIONS

14 "Unmanned Undersea Vehicle With Keel-Mounted Payload
15 Deployment System" (Navy Case No. 75532) filed of even date
16 herewith in the name of Christopher F. Hillenbrand.

17 "Unmanned Undersea Weapon Deployment Structure With
18 Cylindrical Payload Deployment System" (Navy Case No. 75533)
19 filed of even date herewith in the name of Christopher F.
20 Hillenbrand.

21 "Unmanned Undersea Vehicle With Erectable Sensor Mast For
22 Obtaining Position and Environmental Vehicle Status " (Navy Case
23 No. 75534) filed of even date herewith in the names of
24 Christopher F. Hillenbrand and Donald T. Gomez.

1 "Unmanned Undersea Vehicle System for Weapon Deployment"
2 (Navy Case No. 75535) filed of even date herewith in the names
3 of Christopher F. Hillenbrand and Donald T. Gomez.

4 "System for Deploying Weapons Carried In An Annular
5 Configuration In A UUV" (Navy Case No. 75536) filed of even date
6 herewith in the names of Christopher F. Hillenbrand and Donald T.
7 Gomez.

8 "Unmanned Undersea Weapon Deployment Structure With
9 Cylindrical Payload Configuration" (Navy Case No. 76115) filed of
10 even date herewith in the name of Christopher F. Hillenbrand.

11
12 BACKGROUND OF THE INVENTION

13 (1) Field of the Invention

14 The invention relates generally to the field of nautical
15 weapon delivery systems and more particularly to nautical systems
16 for covertly deploying multiple weapons while eliminating the
17 necessity of having manned ships or submarines present at the
18 deployment site.

19 (2) Description of the Prior Art

20 Underwater missiles and torpedoes are currently launched
21 from either the offside of a manned ship or from the torpedo tube
22 of a manned submarine. This current method of deploying
23 underwater weapons requires the actual presence of the ship
24 and/or submarine at the deployment site, thereby posing a number
25 of dangers, including (1) the lives of the people on the ship or
26 submarine, including the equipment itself, are exposed to enemy

1 fire in a danger zone, and (2) ships, as well as submarines in
2 shallow water, are exposed and thereby easily detected by an
3 enemy.

4 Conventional wire-guided torpedoes are available as
5 generally unmanned vehicles, but there are a number of problems
6 in using them as a weapon system platform. A torpedo does not
7 have an arrangement for compensating for buoyancy when a weapon
8 is released from a torpedo shell. Thus, the shock to the torpedo
9 carrier when a weapon is launched will result in an unstable
10 carrier. Also, the torpedo carrier itself is not recoverable,
11 and hence can only be used once.

12 13 SUMMARY OF THE INVENTION

14 It is therefore an object of the invention to provide a new
15 and improved unmanned undersea weapon deployment structure.

16 In brief summary, the invention provides an unmanned
17 undersea vehicle system comprising an axi-symmetrical
18 cylindrically-shaped self-propelled undersea deployment vehicle
19 of predetermined diameter said undersea deployment vehicle having
20 an amidships undersea weapon compartment. The weapon compartment
21 includes means for receiving a weapon and a buoyancy chamber
22 positioned axi-symmetrically within the weapon compartment. The
23 buoyancy chamber is initially empty and has sufficient capacity
24 so that it can be loaded with seawater whose mass approximates
25 the mass of the weapon. The weapon compartment further includes
26 controllable valve means for enabling seawater surrounding the

1 vehicle to fill the buoyancy chamber. Control means controls the
2 deployment of the weapon by expelling the weapon from the weapon
3 compartment and thereafter controlling the firing of the weapon,
4 contemporaneously controlling the valves during weapon deployment
5 to enable filling of the buoyancy chamber to maintain an axi-
6 symmetrical distribution of mass as the weapon is deployed.

7
8 BRIEF DESCRIPTION OF THE DRAWINGS

9 This invention is pointed out with particularity in the
10 appended claims. The above and further advantages of this
11 invention may be better understood by referring to the following
12 description taken in conjunction with the accompanying drawings,
13 in which:

14 FIG. 1 depicts an unmanned undersea weapon deployment system
15 constructed in accordance with the invention;

16 FIG. 2 depicts, in schematic form, the side elevational view
17 of an unmanned undersea vehicle useful in the system depicted in
18 FIG. 1.;

19 FIG. 3 depicts, in schematic form, the side perspective view
20 of a weapon compartment useful in one embodiment of the unmanned
21 undersea vehicle depicted in FIG. 2;

22 FIG. 4 depicts, in schematic form, the sectional view of the
23 weapon compartment depicted in FIG. 3, taken along the line A-A
24 in FIGS. 2 and 3, with the weapons being situated in a non-
25 deployment condition;

1 FIG. 5 depicts, in schematic form, the sectional view of the
2 weapon compartment as depicted in FIG. 4, with the weapons being
3 situated in a deployment condition;

4 FIG. 6 depicts, in schematic form, a detail of a portion of
5 the weapon compartment depicted in FIGS. 3 through 5, which is
6 useful in understanding the weapon deployment operation;

7 FIG. 7 depicts, also in schematic form, the detail of a
8 weapon canister used in the weapon compartment depicted in FIGS.
9 3 through 6, which is useful in understanding the weapon
10 deployment operation;

11 FIG. 8 depicts, in schematic form, the side perspective view
12 of a weapon compartment useful in a second embodiment of the
13 unmanned undersea vehicle depicted in FIG. 2;

14 FIG. 9 depicts, also in schematic form, the sectional view
15 of the weapon compartment depicted in FIG. 8, taken along the
16 line B-B in FIG. 8, with the weapons being situated in a non-
17 deployment condition; and

18 FIG. 10 depicts, also in schematic form, the sectional view
19 of the weapon compartment depicted in FIG. 8, taken along the
20 line B-B in FIG. 8, with the weapons being situated in a
21 deployment condition.

22
23 DESCRIPTION OF THE PREFERRED EMBODIMENT

24 FIG. 1 depicts an unmanned undersea weapon deployment system
25 10 in accordance with the invention. With reference to FIG. 1,
26 the system 10 includes a "mother vehicle" 11 and a unmanned

1 undersea vehicle 12 constructed in accordance with the invention,
2 which are interconnected by a communication link 13 such as an
3 optical fiber. The mother vehicle 11 may be a conventional
4 manned nautical ship (either a surface ship or a submarine), to
5 which may be added (if necessary) mounting means (not separately
6 shown) for holding and releasing the unmanned undersea vehicle
7 into the ocean and for retrieving it from the ocean as described
8 below, and means (also not separately shown) for communicating
9 with the unmanned undersea vehicle to facilitate control of the
10 unmanned undersea vehicle by the mother vehicle as described
11 below.

12 FIG. 2 depicts, in schematic form, the side elevational view
13 of the unmanned undersea vehicle 12 which is useful in the system
14 10 depicted in FIG. 1. With reference to FIG. 2, the unmanned
15 undersea vehicle 12 includes an axi-symmetrical torpedo-shaped
16 outer hull 20 which houses a forward control system compartment
17 21, a weapon system compartment 22 and an aft "control effectors"
18 compartment 23. The central portion of the outer hull 20 is
19 generally cylindrical, with a forward rounded nose (to the left
20 in FIG. 2) and a tapered tail (to the right in FIG. 2).
21 Extending rearwardly of the tail portion is a propeller 30 used
22 to drive the unmanned undersea vehicle 12 selectively in a
23 forward or rearward direction. Extending vertically and
24 horizontally from the tail portion are four fins 31-33. Two of
25 the fins, one identified by reference numerals 30 (shown in FIG.
26 1) on opposing sides of the tail portion extend horizontally

1 therefrom (the second horizontally-extending fin is not shown),
2 and two fins, identified by reference numerals 32 and 33, on
3 opposing sides extend vertically therefrom. The angular
4 orientation of the fins relative to the longitudinal axis of the
5 unmanned undersea vehicle 12 is adjustable to permit steering of
6 the unmanned undersea vehicle horizontally and vertically.

7 The control system compartment 21 includes a number of
8 elements, including local control circuitry 24 for controlling
9 the various elements of the unmanned undersea vehicle 12 in
10 response to commands provided by the mother vehicle 11 (FIG. 1),
11 as well as in response to information as to the unmanned undersea
12 vehicle's external environment as provided by an external sensor
13 25. The local control circuit 24 may include, for example, a
14 conventional auto-pilot and a suitably-programmed digital
15 computer, as well as electrical circuitry for providing control
16 signals to control other components of the unmanned undersea
17 vehicle 12 as described below. The external sensor 25 may
18 comprise, for example, a conventional Doppler sonar device.

19 The aft "control effectors" compartment 23 includes several
20 elements for propelling and steering the unmanned undersea
21 vehicle 12 and, in one embodiment, for connecting the unmanned
22 undersea vehicle to the communication link 13 and for reeling the
23 communication link 13 out as the unmanned undersea vehicle moves
24 away from the mother vehicle 12 and reeling it in as the unmanned
25 undersea vehicle 12 returns towards the mother vehicle 12. In
26 particular, the control effectors compartment 23 includes a motor

1 40 for powering the propeller 30. The motor, in turn, is powered
2 by a battery and motor control circuit 41, which receives motor
3 control information from the local control circuit 24 in the
4 control system compartment 21 over a control link represented by
5 a dashed line 42. The control effectors compartment 23 also
6 includes motors (not shown) for controlling the orientation of
7 the fins 31-33, which are also powered by and under control of
8 the battery and motor control circuit 41. The battery and motor
9 control circuit 41 also provides status information to the local
10 control circuit over the control link 42.

11 In one embodiment, the control effectors compartment 23 also
12 includes a mother vehicle control link 43, which performs the
13 functions of connecting the unmanned undersea vehicle 12 to the
14 communication link and reeling the communication link 13 out and
15 in as the unmanned undersea vehicle 12 moves away from and toward
16 the mother vehicle 11. The mother vehicle control link 43, in
17 turn, provides the command information it receives from the
18 communication link 13 to the local control circuit 24 over an
19 internal communication link represented by dashed line 44. In
20 addition, the local control circuit 24 provides unmanned undersea
21 vehicle status information, including information as to the
22 unmanned undersea vehicle's position and its environment, to the
23 mother vehicle control link 43 over the internal communication
24 link 44, and the mother vehicle control link 44 will transmit
25 that information over the communication link 13 to the mother
26 vehicle 11.

1 In one embodiment, the unmanned undersea vehicle 12 also
2 includes an erectable mast 50, which may be extended in a
3 telescoping manner from the control effectors compartment. The
4 far (upper) end of the mast 50 includes sensor equipment which
5 permits acquisition of certain positioning and environmental
6 information. In particular, the mast 50 includes an optical
7 and/or video camera 51, which may be a CCD device, for obtaining
8 image information as to the vehicle's environment. The camera 51
9 provides the video information to the local control circuit 24,
10 which can process the information and use it locally, and in
11 addition can provide the processed and/or raw video information
12 to the mother vehicle 11. The mother vehicle 11, in turn, can
13 use the information received from the unmanned undersea vehicle
14 12 in determining the commands to be provided to the unmanned
15 undersea vehicle 12.

16 In addition, the mast 50 includes a Geodetic Position System
17 ("GPS") antenna 52. The GPS antenna 52 receives signals from the
18 Geodetic Positioning System maintained by the Federal Government
19 of the United States of America, and provides them to the local
20 control circuit 24 to facilitate determination of the vehicle's
21 location. The Geodetic Positioning System, as is well known,
22 includes a plurality of satellites which revolve around the Earth
23 and transmit signals which a conventional publicly-available GPS
24 receiver can use to identify the location of the receiver in any
25 relevant location on Earth. It will be appreciated that other
26 embodiments may utilize other location positioning systems, such

1 as may be provided by the Federal Government's Loran-C system.
2 In either case, the local control circuit 24 can use the
3 positioning information locally and it can provide the can
4 provide the information to the mother vehicle 11. The mother
5 vehicle 11, in turn, can use the information received from the
6 unmanned undersea vehicle 12 in determining the commands to be
7 provided to the unmanned undersea vehicle 12.

8 As noted above, the unmanned undersea vehicle 12 further
9 includes a weapon compartment 22. The weapon compartment 22
10 stores and deploys weapons, in the form of missiles, under
11 control of the local control circuit 24 operating, in turn, under
12 control of the mother vehicle 11. In one embodiment, which will
13 be described below in connection with FIGS. 3 through 7, the
14 weapon compartment 22 deploys a plurality of weapons axially
15 symmetrically about the unmanned undersea vehicle 12. In a
16 second embodiment, which will be described below in connection
17 with FIGS. 8 through 10, the weapon compartment, identified in
18 those FIGS. by reference numeral 22' deploys the weapons
19 downwardly. In both cases, the weapon compartment can carry a
20 number of missiles and deploy them individually in a plurality of
21 locations. As it deploys the individual weapons, the weapon
22 compartment 22 and 22' maintains axial mass symmetry, which
23 simplifies steering of the vehicle as it is propelled through the
24 ocean, as well as simplifying weapon deployment from multiple
25 positions.

1 FIG. 3 depicts, in schematic form, the side perspective view
2 of weapon compartment 22, and FIG. 4 depicts, in schematic form,
3 the sectional view of the weapon compartment depicted in FIG. 3,
4 taken along the line A-A in FIGS. 2 and 3. In FIGS. 2 and 3, the
5 weapons are shown in retracted, non-deployed condition. FIG.
6 FIG. 5 depicts, in schematic form, the sectional view of the
7 weapon compartment as depicted in FIG. 4, with the weapons being
8 situated in an extended, deployment condition. With reference to
9 those figures, the weapon compartment 22 includes a central core
10 60, preferably comprising a buoyant material, having a central
11 aperture 61 which extends therethrough from the forward control
12 system compartment 23 to the rear control effectors compartment
13 24. The central aperture 61 is co-axial with the weapon
14 compartment 22 and provides a passageway through which the
15 connections extend between the forward control system compartment
16 23 and the rear control effectors compartment 24.

17 In addition, around the exterior surface of the central core
18 60 is formed a plurality of recesses 63(1) through 63(6)
19 (specifically shown in FIG. 5, and generally identified by
20 reference numeral 63(i)). In each recess 63(i) is mounted a
21 pivotable weapon deployment device 62(1) through 62(6) (generally
22 identified by reference numeral 62(i)). FIGS. 3 and 4 show the
23 weapon deployment devices 62(i) in a retracted, non-deployed
24 position, FIG. 5 shows the weapon deployment devices 62(i) in an
25 extended, deployed position, and FIG. 6 shows a detail of a
26 weapon deployment device 62(1) useful in understanding deployment

1 thereof. Each weapon deployment device 62(i) comprises a weapon
2 canister 64(i) mounted on a pivotable arm 65(i). When retracted,
3 as shown in FIGS. 3 and 4, the weapon deployment canister 64(i)
4 and arm 65(i) fits into the respective recess 63(i). The outer
5 surfaces of the arms 65(i) are contoured to conform to and form
6 the cylindrical outer surface of portion of the hull 20
7 comprising the weapon compartment 22.

8 As noted above, FIG. 5 shows the weapon deployment devices
9 62(i) in their respective deployed positions. As shown in FIG.
10 5, in the deployed positions, the weapon deployment devices 62(i)
11 are pivoted about respective pivot points 66(i) so that the
12 weapon canisters 64(i) are positioned beyond the surface of the
13 hull 20. As shown in FIG. 6, the weapon deployment devices 62(i)
14 are pivoted between the retracted, non-deployed position and the
15 extended, deployed position by respective electrical motors 67(i)
16 through a gear train 68(i). The motors 67(i), in turn, are
17 controlled by the local control circuit 24 (FIG. 1). It will be
18 appreciated that a plurality of motors and associated gear trains
19 may be situated along the length of the weapon compartment 22 to
20 provide for more rapid pivoting of the associated weapon
21 deployment device 62(i) than may be provided by a single
22 motor/gear train.

23 The procedure used in deploying and firing missiles from the
24 weapon compartment 22 will be described in connection with FIG.
25 7, as well as FIGS. 3 through 6. Initially, the local control
26 circuit 24, under control of the mother vehicle 11, has guided

1 the unmanned undersea vehicle 12 to a position in which a missile
2 is to be deployed and fired. While the unmanned undersea vehicle
3 12 is being propelled to the deployment and firing position, the
4 weapon deployment devices 62(i) will be in the retracted, non-
5 deployed position. After the unmanned undersea vehicle 12
6 arrives at the deployment and firing position, the local control
7 circuit 24, if commanded by the mother vehicle 11 to actually
8 deploy and fire one or more of the weapons, will actuate the
9 motors 67(i) that are associated with all of the weapon
10 deployment devices 62(i) and enable them to pivot the weapon
11 deployment devices 62(i) to the deployed condition. By deploying
12 all of the weapon deployment devices 62(i) symmetrically about
13 the axis of the unmanned undersea vehicle 12, the unmanned
14 undersea vehicle 12 is assured that it will not be forced from
15 the deployment position.

16 After all of the weapon deployment devices 62(i) have been
17 pivoted to the extended, deployed position, missiles contained in
18 one or more of the weapon canisters 64(i) may be fired. The
19 firing process will be described in connection with FIG. 7. With
20 reference to FIG. 7, the weapon canister 64(i) comprises a
21 cylindrical canister body 80(i), a forward end cap 81(i) and a
22 rear end cap 82(i). Prior to firing, the end caps 81(i) and
23 82(i) are affixed to the canister body 80(i) to form a housing
24 for a missile 83(i). When affixed to the canister body 80(i),
25 the end caps 81(i) and 82(i) seal the interior of the canister
26 64(i) from seawater surrounding the canister.

1 When the missile 83(i) inside of the weapon canister 64(i)
2 is fired, air pressure from the combusted gases generated during
3 the firing process builds up inside the canister 64(i), which
4 enables the end caps 81(i) and 82(i) to be blown off the canister
5 body 80(i). When the end caps 81(i) and 82(i) are off the
6 canister 64(i), the missile will thereafter propel itself
7 forward. In addition, seawater from outside of the canister will
8 enter the interior of the canister.

9 After the missile 83(i) has been fired, the local control
10 circuit 24 can actuate the motors 67(i) to enable the weapon
11 deployment devices 62(i) to be pivoted between the extended,
12 deployed position and the retracted, non-deployed position. In
13 that operation, the seawater which entered the canisters 64(i) of
14 the weapon deployment devices 62(i) when the respective missiles
15 therein were fired will remain therein. The seawater in the
16 canisters 64(i) for the fired missiles will help to maintain the
17 symmetry of mass around the longitudinal axis of the unmanned
18 undersea vehicle 12, which, in turn, will simplify controlling
19 the unmanned undersea vehicle 12 as it thereafter propels itself
20 beyond the weapon deployment and firing position.

21 While the unmanned undersea vehicle 12 including weapon
22 compartment 22 has been depicted in FIGS. 3 through 7 as
23 providing six weapon deployment devices 62(i), it will be
24 appreciated that any number of weapon deployment devices 62(i)
25 may be provided in the unmanned undersea vehicle 12.

1 FIG. 8 depicts, in schematic form, the side perspective view
2 of the second embodiment weapon compartment 22'. Insofar as the
3 invention is presently understood, weapon compartment 22'
4 embodies the preferred mode of invention, with respect to the
5 instant above-entitled invention. In the weapon compartment 22',
6 two weapons 90(F) and 90(A) are positioned fore and aft toward
7 the bottom of the weapon compartment 22'. In addition, forward
8 and aft buoyancy tanks 91(F) and 91(A) are provide proximate to
9 and above the correspondingly-indexed weapons 90(F) and 90(A).
10 Positioned between the buoyancy tanks 91(F) and 91(A) is a mother
11 vehicle control link 92, which performs the same function as
12 mother vehicle control link 43 (FIG. 2); in a unmanned undersea
13 vehicle 12 which incorporates weapon compartment 22', the mother
14 vehicle control link 43 is not present in the aft control
15 effectors compartment 23. Each buoyancy tank 91(F) and 91(A) is
16 provided with a plurality of actuatable valves 93(F) and 93(A)
17 which provide a controllable path to enable seawater exterior of
18 the weapon compartment to flow into the respective buoyancy tank
19 91(F) and 91(A) during deployment and firing of the respective
20 weapon 90(F) and 90(A) as described below.

21 The operations performed by the unmanned undersea vehicle
22 12, in particular by the weapon compartment 22', in connection
23 with deployment and firing of the weapons 90(F) and 90(A) will be
24 described in connection with FIGS. 9 and 10. FIG. 9 depicts,
25 also in schematic form, the sectional view of the weapon
26 compartment depicted in FIG. 8, taken along the line B-B in FIG.

1 8, with the weapon 90(F) being situated in a non-deployment
2 condition; and FIG. 10 depicts, also in schematic form, the
3 sectional view of the weapon compartment depicted in FIG. 8,
4 taken along the line B-B in FIG. 8, with the weapon 90(A) being
5 situated in a deployment condition.

6 With reference to FIG. 9, weapon compartment 22' is provided
7 with a trap door 94 proximate the weapon 90(F), to facilitate
8 deployment and firing of the weapon. The trap door 94 is curved
9 to provide an arc that, when closed (FIG.9), the trap door 94
10 forms part of the cylindrical hull 20. Initially, the unmanned
11 undersea vehicle 12, in response to commands from the mother
12 vehicle 11 as described above, moves to a position at which it is
13 to deploy and fire a weapon. Thereafter, the local control
14 circuit 24, also in response to commands from the mother vehicle
15 11, enables the trap door 94 to open and the weapon compartment
16 to expel the weapon 90(F) downwardly. (It will be appreciated
17 that weapon 90(A) can also be expelled if both weapons are to be
18 fired contemporaneously.) After the weapon(s) has (have) been
19 expelled to a position completely exterior of the weapon
20 compartment 22', the weapon(s) can be fired. It will be
21 appreciated that, to facilitate complete expulsion of the
22 weapon(s) from the weapon compartment 22', the opening provided
23 by the open trap door 94 will be at least as large as the
24 diameter of the respective weapon. After deployment and firing
25 of the weapon(s) the local control circuit 24 may enable the trap

1 door 94 to close. Similar operations may be performed if only
2 weapon 90(A) is to be deployed and fired.

3 During the deployment and firing operation, as a weapon
4 90(F) or 90(A) is expelled, seawater enters the cavity from which
5 the weapon was expelled. Contemporaneously, to maintain an
6 axially-symmetrical distribution of mass and buoyancy in the
7 weapon compartment 22', the valves 93(F) or 93(A) connected to
8 the respective buoyancy tank 91(F) or 91(A) are also actuated to
9 enable seawater to enter the buoyancy tank. Accordingly, when
10 forward weapon 90(F) is deployed and fired, the forward buoyancy
11 tank 91(F) is filled, and when aft weapon 90(A) is deployed and
12 fired, the aft buoyancy tank 91(A) is filled. The seawater in
13 the buoyancy tanks 91(F) and 91(A) for the fired weapons will
14 help to maintain the symmetry of mass around the longitudinal
15 axis of the unmanned undersea vehicle 12, which, in turn, will
16 simplify controlling the unmanned undersea vehicle 12 as it
17 thereafter propels itself beyond the weapon deployment and firing
18 position.

19 While the unmanned undersea vehicle 12 including weapon
20 compartment 22' has been described as providing two weapons 90(F)
21 and 90(A) and an associated number of buoyancy tanks 91(F) and
22 91(A), it will be appreciated that any number of weapons and
23 associated buoyancy tanks may be provided in the unmanned
24 undersea vehicle 12.

25 The unmanned undersea vehicle 12 provides a number of
26 advantages. In particular, it provides a covert means for

1 deploying multiple underwater missiles and/or torpedoes from a
2 remotely operated and submerged platform. The unmanned undersea
3 vehicle eliminates the necessity of having ships or submarines
4 and their personnel at the deployment site. In addition, it
5 provides a covert means for detecting enemy targets. The
6 unmanned undersea vehicle is particularly useful in mapping and
7 eliminating undersea mine fields. In addition, the unmanned
8 undersea vehicle is relatively economical, since it is easily
9 recoverable; the mother vehicle 11 can, through suitable commands
10 provided to the local control circuit 24, enable the unmanned
11 undersea vehicle to, after the weapons are deployed and fired,
12 propel itself back to the mother vehicle 11 for retrieval. The
13 flooding of the weapon canisters 64(i) in weapon compartment 22,
14 and of the weapon cavity in weapon compartment 22', maintains the
15 stability of the submerged unmanned undersea vehicle during the
16 weapon deployment and launching process.

17 The preceding description has been limited to a specific
18 embodiment of this invention. It will be apparent, however, that
19 variations and modifications may be made to the invention, with
20 the attainment of some or all of the advantages of the invention.
21
22
23

1 Navy Case No. 76117

2
3 UNMANNED UNDERSEA VEHICLE INCLUDING KEEL-MOUNTED PAYLOAD
4 DEPLOYMENT ARRANGEMENT WITH PAYLOAD COMPARTMENT FLOODING
5 ARRANGEMENT TO MAINTAIN AXI-SYMMETRICAL MASS DISTRIBUTION

6
7 ABSTRACT OF THE DISCLOSURE

8 In brief summary, the invention provides an unmanned
9 undersea vehicle system comprising an axi-symmetrical
10 cylindrically-shaped self-propelled undersea deployment vehicle
11 of predetermined diameter said undersea deployment vehicle having
12 an amidships undersea weapon compartment. The weapon compartment
13 includes means for receiving a weapon and a buoyancy chamber
14 positioned axi-symmetrically within the weapon compartment. The
15 buoyancy chamber is initially empty and has sufficient capacity
16 so that it can be loaded with seawater whose mass approximates
17 the mass of the weapon. The weapon compartment further includes
18 controllable valve means for enabling seawater surrounding the
19 vehicle to fill the buoyancy chamber. Control means controls the
20 deployment of the weapon by expelling the weapon from the weapon
21 compartment and thereafter controlling the firing of the weapon,
22 contemporaneously controlling the valves during weapon deployment
23 to enable filling of the buoyancy chamber to maintain an axi-
24 symmetrical distribution of mass as the weapon is deployed.

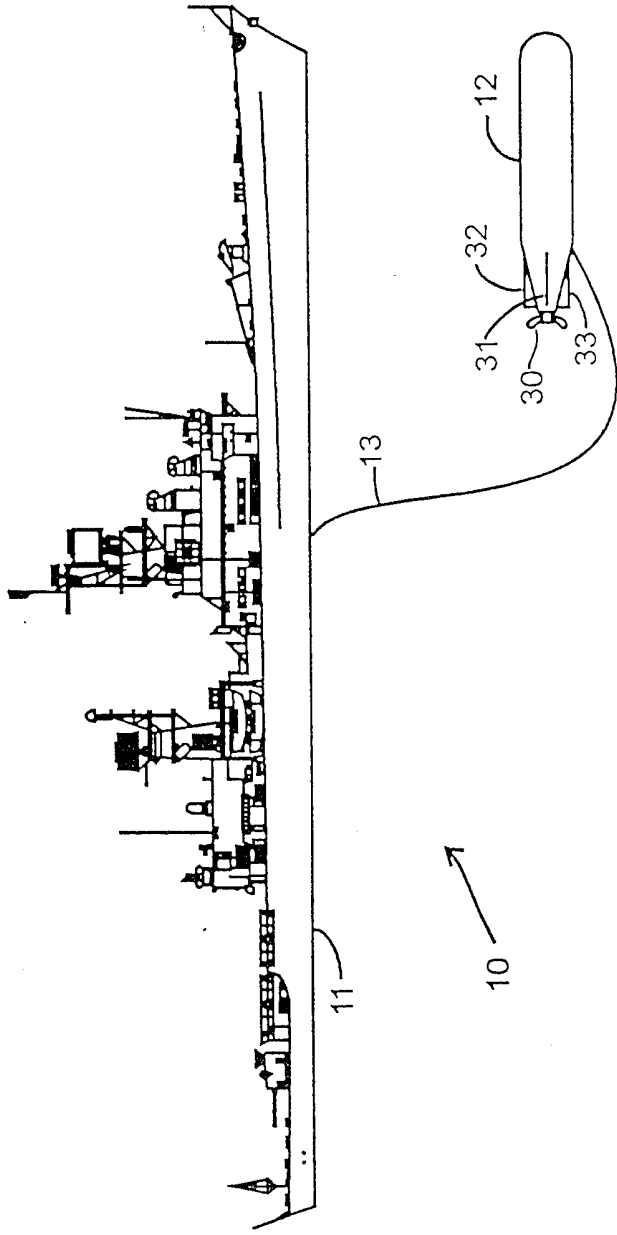
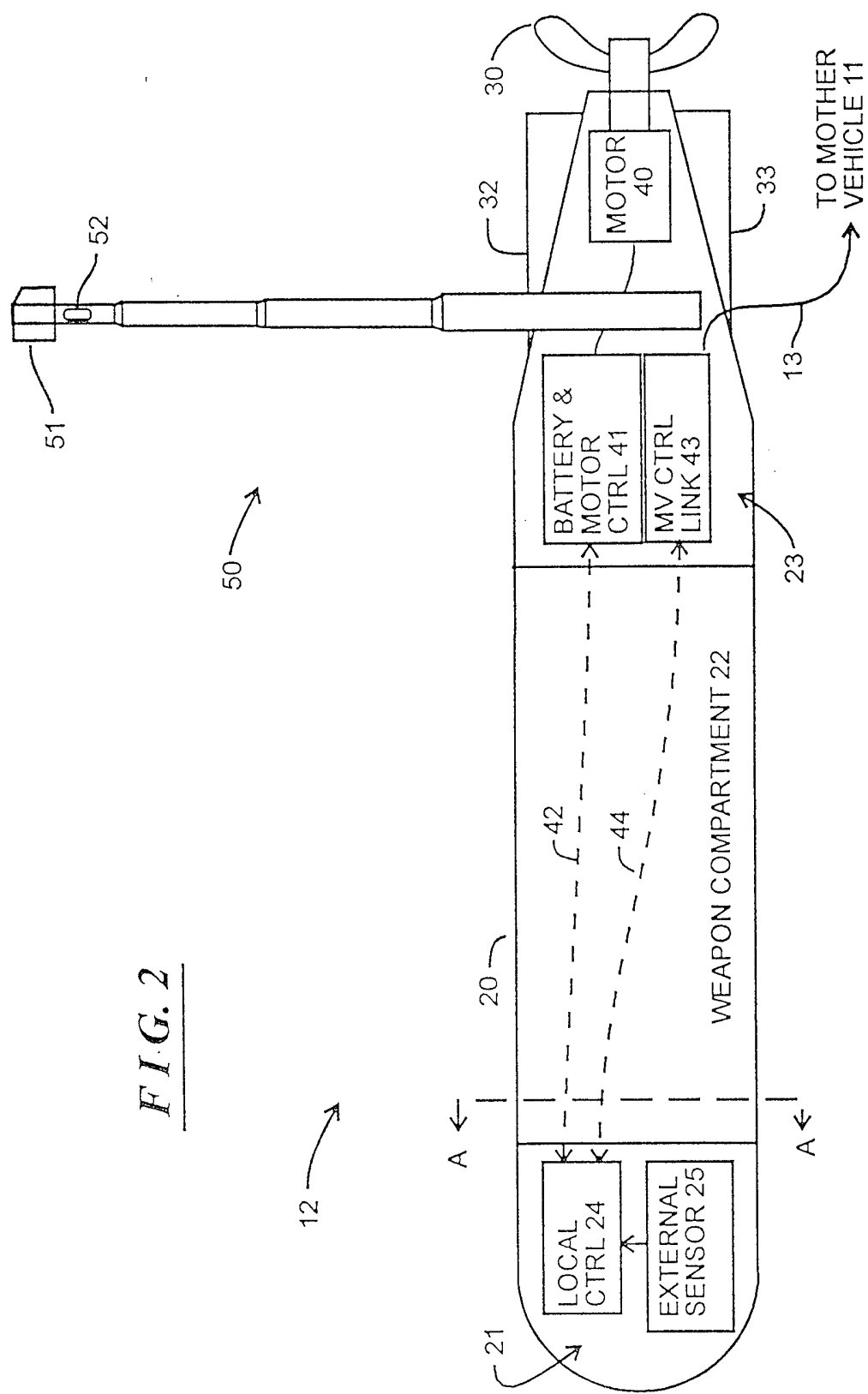


FIG. 1

FIG. 2



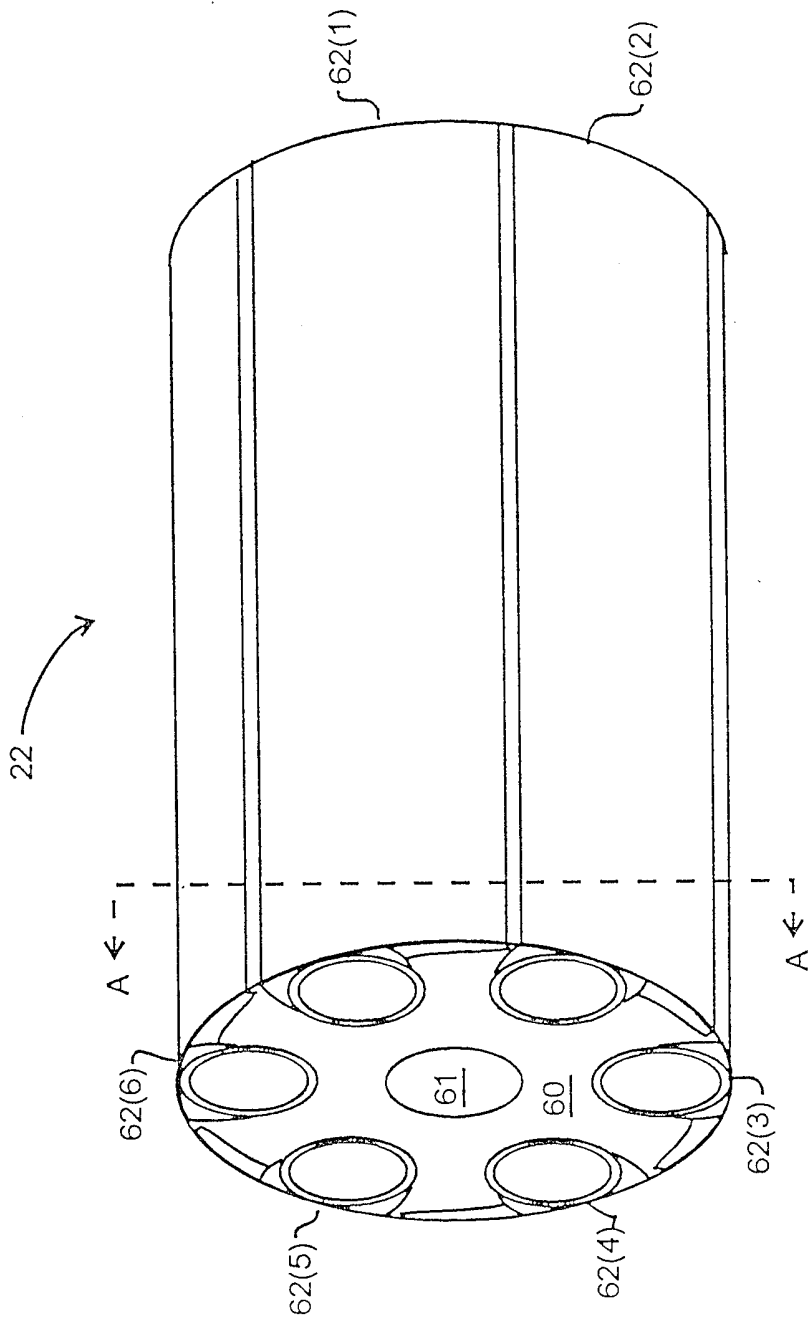


FIG. 3

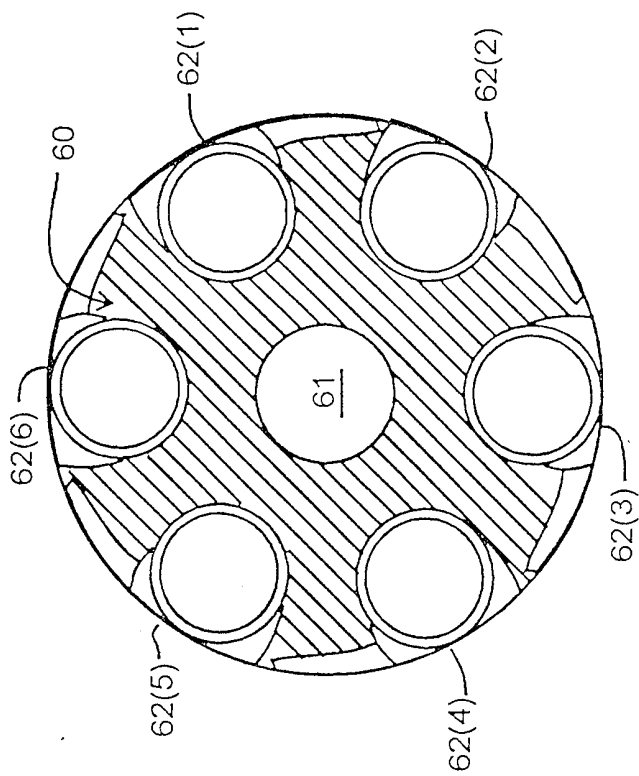


FIG. 4

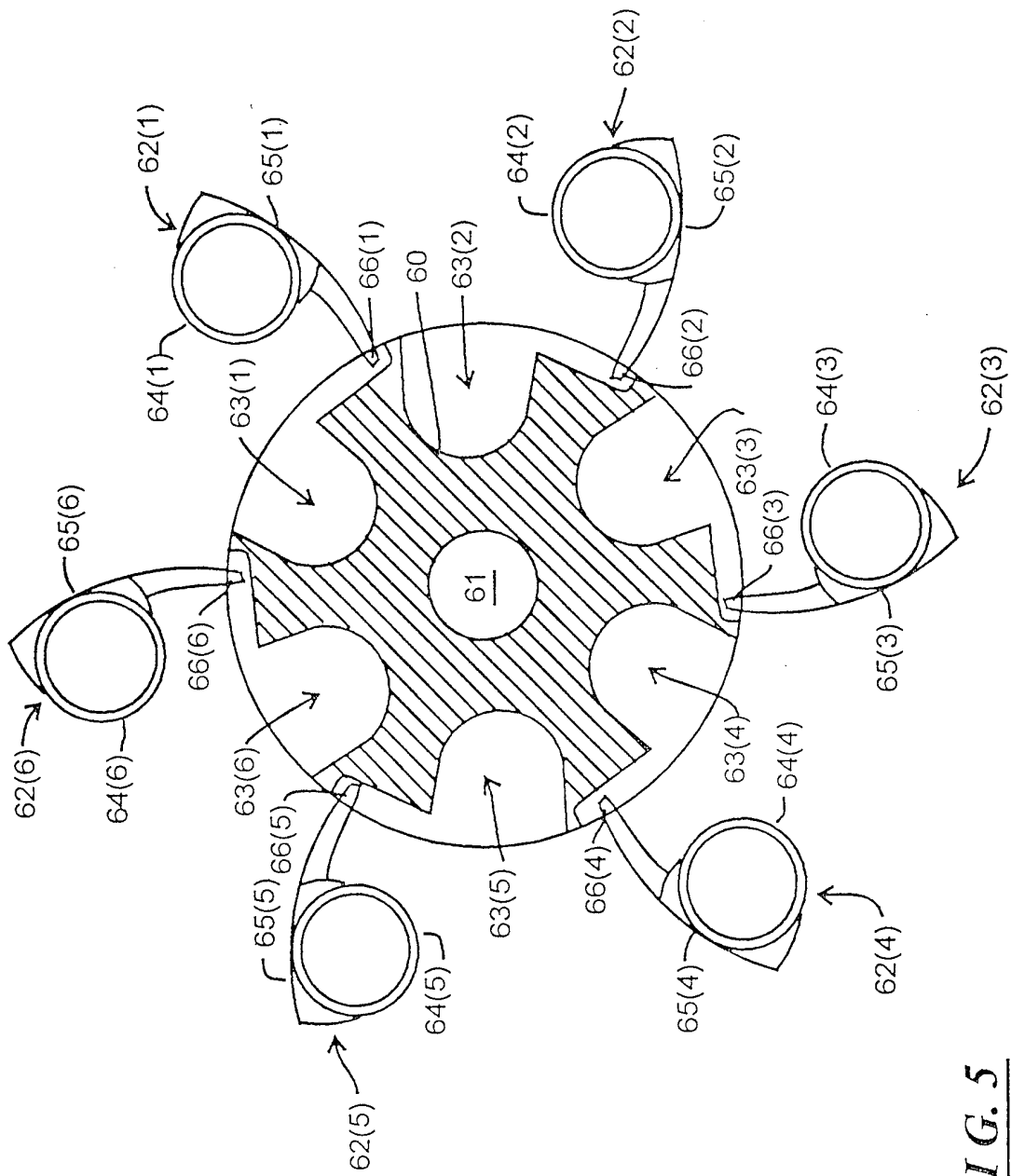


FIG. 5

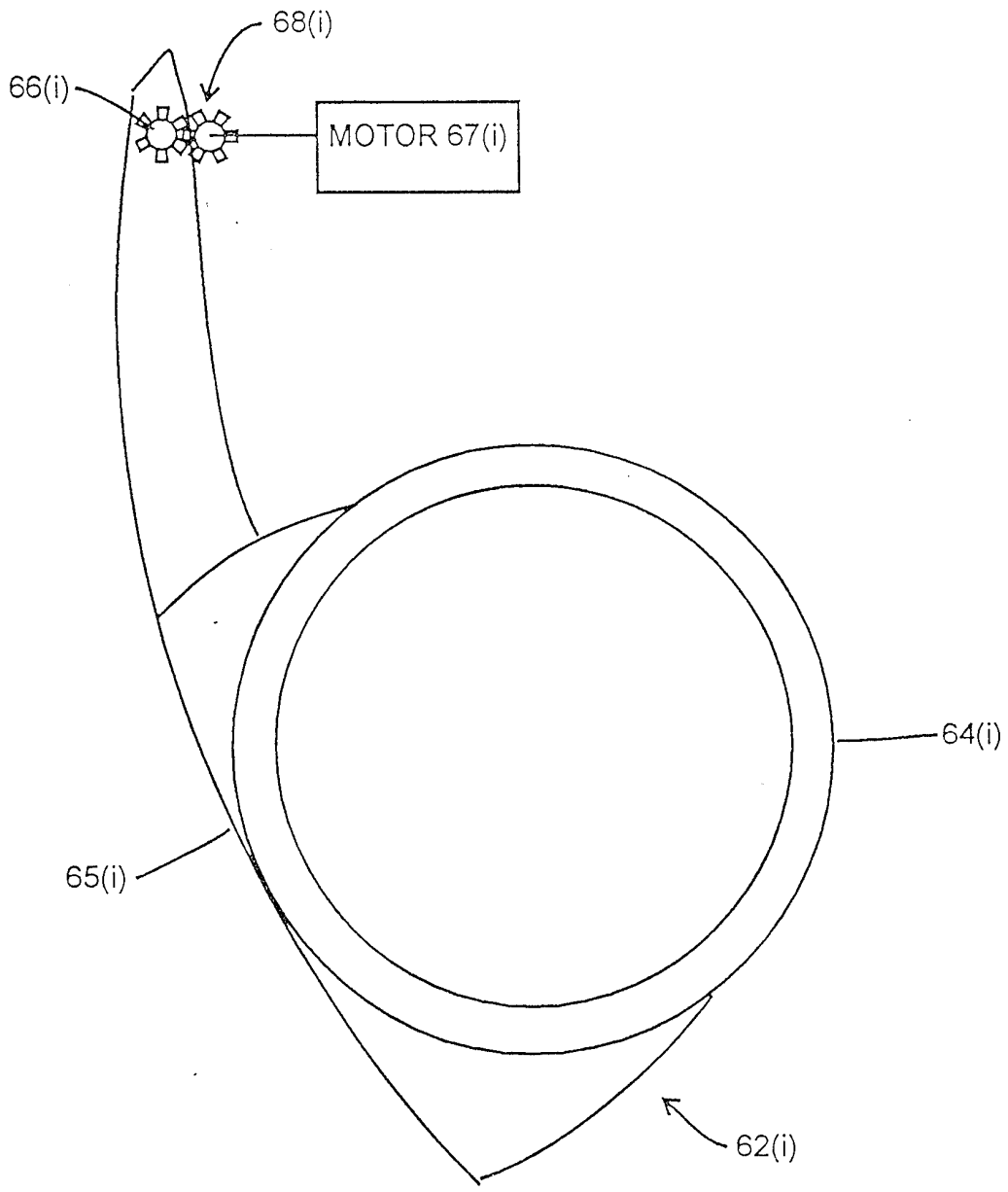


FIG. 6

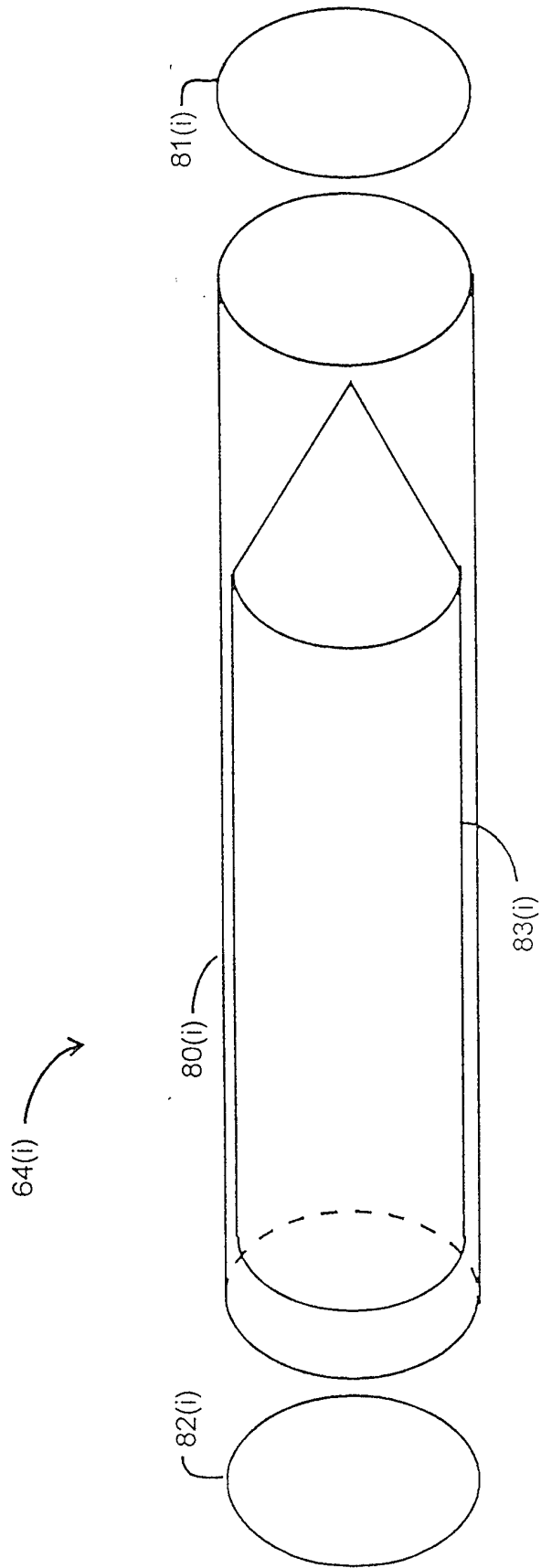


FIG. 7

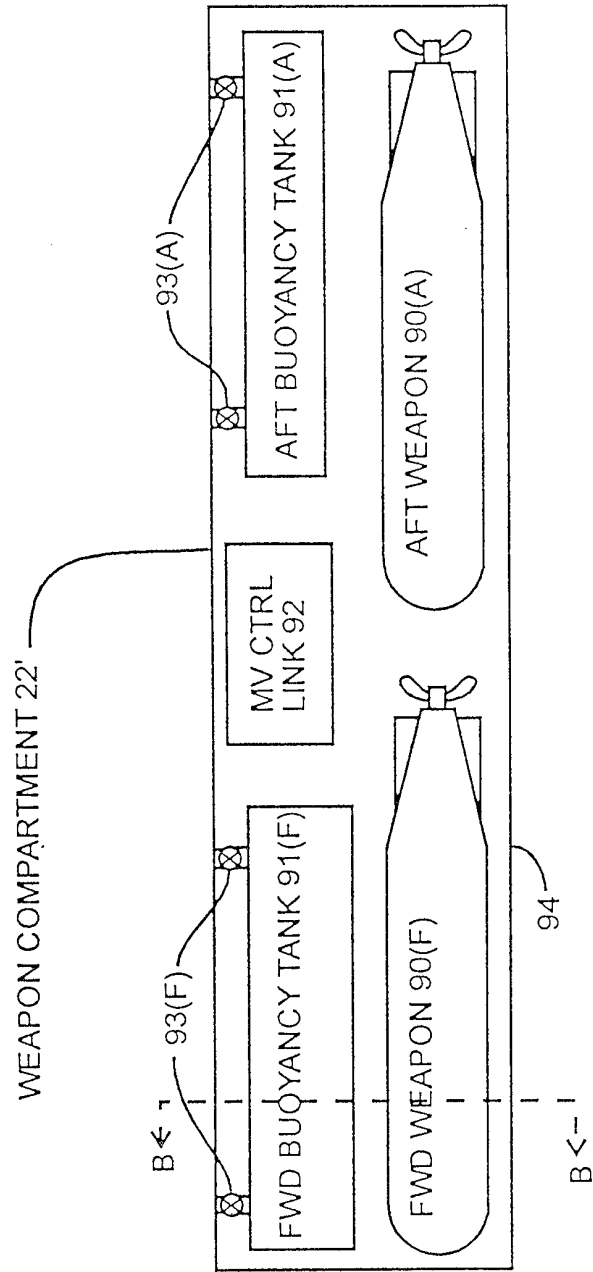


FIG. 8

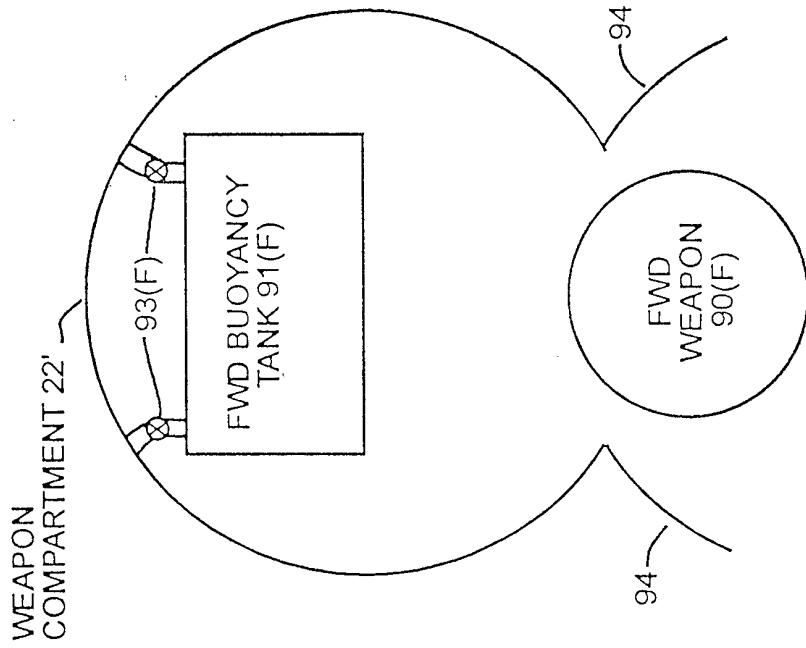


FIG. 9

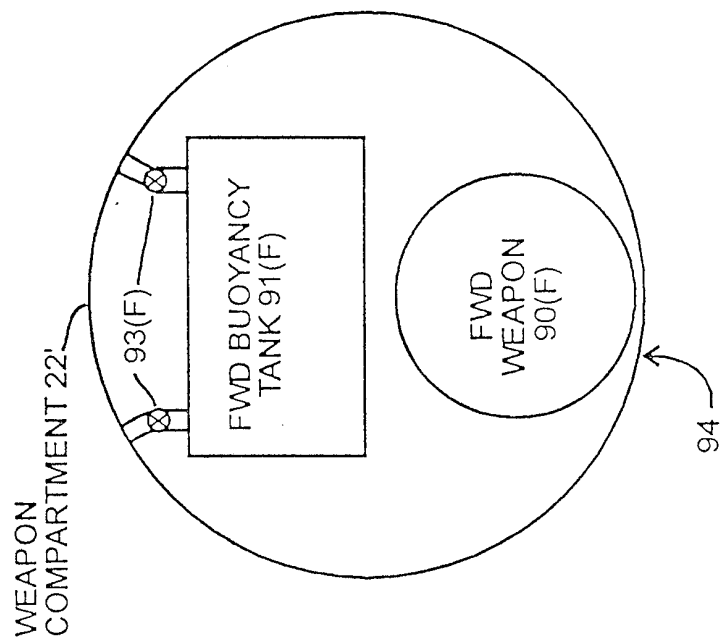


FIG. 10