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CODE OOCC
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Navy Case No. 77547

# SUBMERSIBLE DEVICE LAUNCHER

## STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

## BACKGROUND OF THE INVENTION

(1) Field of the Invention

This invention generally relates to a submersible device launcher and more specifically to an apparatus for housing a submersible device launcher such that the submersible device launcher may be test launched without the use of a submarine.

(2) Description of the Prior Art

The U.S. Navy currently uses a three-inch device delivery system within a submarine to launch three-inch countermeasure devices, pyrotechnic and communication devices, and bathythermograph probes. Currently, it is not feasible to perform functional and reliability tests on new or improved 'live' pyrotechnic devices in a laboratory facility for the three-inch device launcher due to the explosive nature of the markers and flares utilized therein. It is therefore desirable

to test launch from a three-inch delivery system without having the expense of deploying a submarine for that purpose. Heretofore, there have been no suitable solutions to this problem in the art.

Known structures for the testing of various launching devices include the following:

U.S. Patent No. 3,062,047 to Armi et al. discloses an apparatus for the determination of interior ballistics. Although the ballistic testing equipment is mounted on a platform, the device is not submersible.

U.S. Patent No. 3,075,301 to Feidler et al., discloses a launch and underwater trajectory test vehicle which is launched from an underwater launching device. The underwater launching device may take the form of a mobile or stationary device, however any further description thereof is not provided.

U.S. Patent No. 3,693,432 to Stewart et al. discloses an artillery gun shock simulator. There is no teaching or suggestion, however, of mounting the simulator underwater to achieve a submersible test device.

U.S. Patent No. 4,776,277 to Fiedler et al. discloses a method and arrangement for implementing an operational test on electrically-actuatable ignition circuits for ammunition. The apparatus includes a supply apparatus, control apparatus and measuring apparatus all resting on the ground with no additional

particular support structure shown. Further, the device is not disclosed as being of a submersible nature, particularly absent any support structure for accomplishing cohesive submersion.

## SUMMARY OF THE INVENTION

Therefore it is an object of this invention to provide a dedicated submersible launcher to perform functional and reliability tests on various commonly launched devices.

Another object of the invention is to provide a submersible platform upon which a device launcher may be mounted to perform functional and reliability tests on various 'live' pyrotechnic devices.

Still yet another object of the invention is to provide a submersible platform which is portable between various locations and includes launcher mounting and support members for that purpose.

In accordance with one aspect of this invention, a submersible device launcher includes an external cage structure having at least a base, an overhead reinforcing member and a plurality of corner posts connecting the base to the overhead reinforcing member. A launcher barrel is mounted to a side wall of the external cage structure adjacent the overhead reinforcing member and extends towards the interior of the external cage structure. A half-wall is mounted to and braced against the base of the external cage structure at a peripheral edge thereof, and

an impulse cylinder is mounted to the half wall and connected by piping to the launcher barrel.

A firing valve is anchored to the base of the external cage structure at a peripheral edge thereof and in proximity to the impulse cylinder. A first support bench is mounted to a first corner post of the external cage structure at a position above the base, and an air flask is seated on the first support bench and held in a stationary position thereon by prong members extending upwardly from the first support bench conformally around a base of the air flask and further attached to the first corner post by a band member.

An underwater junction box is mounted to a second corner post of the external cage structure at a position above the base, and a display panel is remotely positioned above the water surface and connected to the underwater junction box by a cable to operate the firing valve and to monitor depth pressure, firing valve pressure, air flask pressure and impulse cylinder at battery and fired positions.

Additionally, each of the launcher barrel, impulse cylinder, firing valve, air flask, and underwater junction box are positioned within the external cage structure such that upon submersion thereof an evenly balanced arrangement is present.

## BRIEF DESCRIPTION OF THE DRAWINGS

The appended claims particularly point out and distinctly claim the subject matter of this invention. The various objects, advantages and novel features of this invention will be more fully apparent from a reading of the following detailed description in conjunction with the accompanying drawings in which like reference numerals refer to like parts, and in which:

FIG. 1 is a diagram partially in schematic showing conventional elements of a submarine signal launcher;

FIG. 2 is a left side perspective view of the submersible test launching platform according to the present invention;

FIG. 3 is a right side perspective view of the submersible test launching platform according to the present invention; and

FIG. 4 is a rear view of the submersible test launching platform according to the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 depicts a partially schematic diagram showing details of a submarine signal launcher.

The submersible device launcher shown in FIG. 1 includes of a three-inch launcher barrel 10, impulse cylinder 12, firing valve 14, air flask 16, underwater junction box 18, and display panel 20.

The three-inch launcher barrel 10 is a standard U.S. submarine fleet barrel with all of the standard clearances, guide slot, trip bolt, detent, shear valve, and breech door with

locking ring. These features are not specifically shown as they are not critical to an understanding of the invention. The three-inch devices are loaded in the barrel 10 in the same manner as on board the submarine.

The impulse cylinder 12 is a standard U.S. submarine impulse cylinder. The impulse cylinder 12 is connected to and provides the hydrodynamic force necessary for ejecting the device from the launcher barrel 10.

The firing valve 14 is connected between the impulse cylinder 12 and the air flask 16 and includes a special submersible valve that provides air pressure to an air side of a piston of the launcher impulse cylinder 12 for launching the devices from the launcher barrel 10.

The air flask 16 provides the required air pressure and volume to the impulse cylinder 12 via the firing valve 14 to eject the device from the launcher barrel 10.

The underwater junction box 18 is the interface link to monitor various signals in the launcher system and is appropriately connected to each of the three-inch launcher barrel 10, the impulse cylinder 12, the air flask 16, the firing valve 14, and the cage structure 26.

The underwater junction box 18 is connected to a pressure sensor 18a positioned between air flask 16 and firing valve 14. It is connected to a second pressure sensor 18b positioned between firing valve 14 and impulse cylinder 12. Junction box 18 is also connected to firing valve 14 to provide a launch signal,

and to impulse cylinder 12 to monitor whether the impulse cylinder 12 is in the at-battery position or the fired position. The junction box is further connected at 18c to the three-inch launcher barrel 10 to give a device away indication signal. Another connection 18d is attached to a cage structure 26 to provide a ground.

The display panel 20 is positioned at the surface of the water for dry use and is attached to the underwater junction box 18 by means of a cable 21. The display panel 20 includes a launch button 22 to launch the device as well as various displays 24a, 24b, 24c, 24d, 24e, 24f, 24g, and 24h to monitor and control conditions on the submersible launcher. These various displays of the submersible launcher will include a launch enable viewing screen 24a, a launch button 22, display panel power 24b, ram at-battery/fired conditions 24c, device present/away indications 24d, velocity display 24e, flask pressure 24f, depth gage 24g, and firing valve pressure 24h. These various elements are known to be required for monitoring and controlling a launch device and therefore, will not be further explained herein for the sake of brevity.

The submersible three-inch device launcher barrel 10 is capable of launching devices at the maximum required barrel exit velocity. The launcher barrel 10 fires the devices by means of an electrical signal initiated at the display panel 20 at the surface.

Referring next to FIGS. 2 through 4, the launcher is capable of being lowered as a unit within cage structure 26 to a desired depth from a pier or a surface craft. The cage structure 26 includes a base platform 28, a plurality of upstanding corner supports 30a, 30b, 30c, and 30d, and intermediate beams 32a - 32d opposite base platform 28. The shape of the cage structure 26 should accommodate the components of the launcher and provide a structural integrity to the device which will withstand submersion to any necessary depth and maintain all of the components in a fixed relationship.

By way of example, and as shown in each of FIGS. 2, 3 and 4, the submersible cage structure 26 includes a rectangular base platform 28 and four upstanding corner supports 30a, 30b, 30c and 30d, one support being positioned at each corner of the base platform 28. Upper ends of the upstanding corner supports 30a through 30d are connected together by intermediate beams 32a, 32b, 32c, and 32d resulting in an overhead reinforcement 32 corresponding in shape to the base platform 28. Opposing diametrical corners of the base platform and overhead reinforcement are stiffened with angled beams 36a, 36b, 36c, 36d connecting the base platform 28 to adjacent upstanding corner supports 30a, 30b, 30c, and 30d, and connecting the overhead reinforcements 32a, 32b, 32c, 32d to adjacent upstanding corner supports. An additional strong brace beam 38 is provided on the overhead reinforcements 32a, 32c, to provide lifting capability for cage structure 26.

In order to specifically support the components within the cage structure 26, there are provided individual supports as follows. A pair of intermediate vertical beams 40a, 40b are positioned at a rear side of the cage between upstanding corner supports 30a, 30b. A brace 42 is positioned between the intermediate vertical beams 40a, 40b, and a bar 44 is connected between the brace 42 and a base end of the three-inch launcher barrel 10 as most clearly shown in FIG. 4. The opposing end of the three-inch launcher barrel 10 is connected to a plate-like brace 46 mounted with an L-shaped bracket 48 to the pair of intermediate vertical beams 40a, 40b.

Mounting of the impulse cylinder 12 is best viewed from FIG. 3 and includes a half-wall member 50 braced against the base platform 28 by a support member 52. The impulse cylinder 12 is mounted to the half-wall member 50 by any suitable means and normal fluid connections are utilized between the impulse cylinder 12 and the three-inch launcher barrel 10. The firing valve 14 is fixed directly to the base platform 28 in proximity to the impulse cylinder 12, with suitable connections therebetween.

In order to support the air flask 16, there is provided a bench member 54 mounted to one of the upstanding corner supports 30c as best shown in FIG. 3. The base of the air flask 16 is supported on the bench member 54 by use of prongs 56 extending upwardly therefrom in order to grip the base of the air flask 16.

An upper end of the air flask 16 is anchored to the upstanding corner support 30c with a reinforced band 58.

The underwater junction box 18 is supported on a bench member 60 similar in construction to the bench member 54. The bench member 60, however, is mounted to an adjacent upstanding corner support 30b on the same side of the cage structure 26 as the bench member 54 of the air flask 16.

Cable 21 for the display panel 20 extends from the junction box 18 to the surface and to the display panel 20. The display panel 20 is operated in any suitable location on the surface of the water such as within a support craft or on a dock.

In order to raise and lower the cage structure 26 into and out of the water for testing purposes, a plurality of hoisting members 38, 61a, 61b, 61c, and 61d are provided on the periphery of the overhead reinforcement 32. At least a pair of hoisting members 61e, and 61f are provided on the periphery of the base platform 28. Appropriate chains or cables (not shown) may be threaded through these hoisting members and attached in turn to a crane for raising, lowering and generally positioning the cage structure 26.

The arrangement described is that which will enable a balanced submersion of the cage structure 26, thereby enabling optimum performance of all essential components of the test launching platform.

The deployment of a submarine for the purpose of performing functional and reliability tests on new and improved pyrotechnic

devices is very expensive. The disclosed submersible three-inch device launcher provides an alternative cost effective means of conducting these tests.

The submersible three-inch device launcher therefore also provides an alternative cost effective means of conducting functional and reliability tests on new and/or improved pyrotechnic devices. The launcher is also portable and capable of being deployed from a pier or surface craft that has a 5 ton crane. The devices are launched from the surface by means of an electrical signal from the display panel 20 to the submersible firing valve.

There is currently only one way to perform functional and reliability tests on new or improved 'live' pyrotechnic three-inch devices. The only way to perform these tests is on board a U.S. Navy submarine. The deployment of a submarine for the purpose of performing functional and reliability tests on new or improved pyrotechnic devices is not cost effective. The submersible three-inch device launcher provides an alternative cost effective means of conducting these tests.

This invention has been disclosed in terms of certain embodiments. It will be apparent that many modifications can be made to the disclosed apparatus and method without departing from the invention. Therefore, it is the intent

to cover all such variations and modifications as come within the true spirit and scope of this invention.

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# SUBMERSIBLE DEVICE LAUNCHER

## ABSTRACT OF THE DISCLOSURE

A submersible device launcher includes an external cage structure including at least a base, an overhead reinforcing member and a plurality of corner posts connecting the base to the overhead reinforcing member. A launcher barrel is mounted to the external cage structure, a half-wall is mounted to and braced against the base of the external cage structure at a peripheral edge thereof, and an impulse cylinder is mounted to the half wall for connection to the launcher barrel. A firing valve is anchored to the base of the external cage structure, a first support bench is mounted to a first corner post of the external cage structure, and an air flask is seated on the first support bench and held in a stationary position thereon by prong members extending upwardly from the first support bench and further attached to a corner post by a band member. An underwater junction box is mounted to another corner post of the external cage structure, and a display panel is remotely positioned above the water surface for operating the firing valve and monitoring depth pressure firing valve pressure, air flask pressure and impulse cylinder at-battery and firing positions.

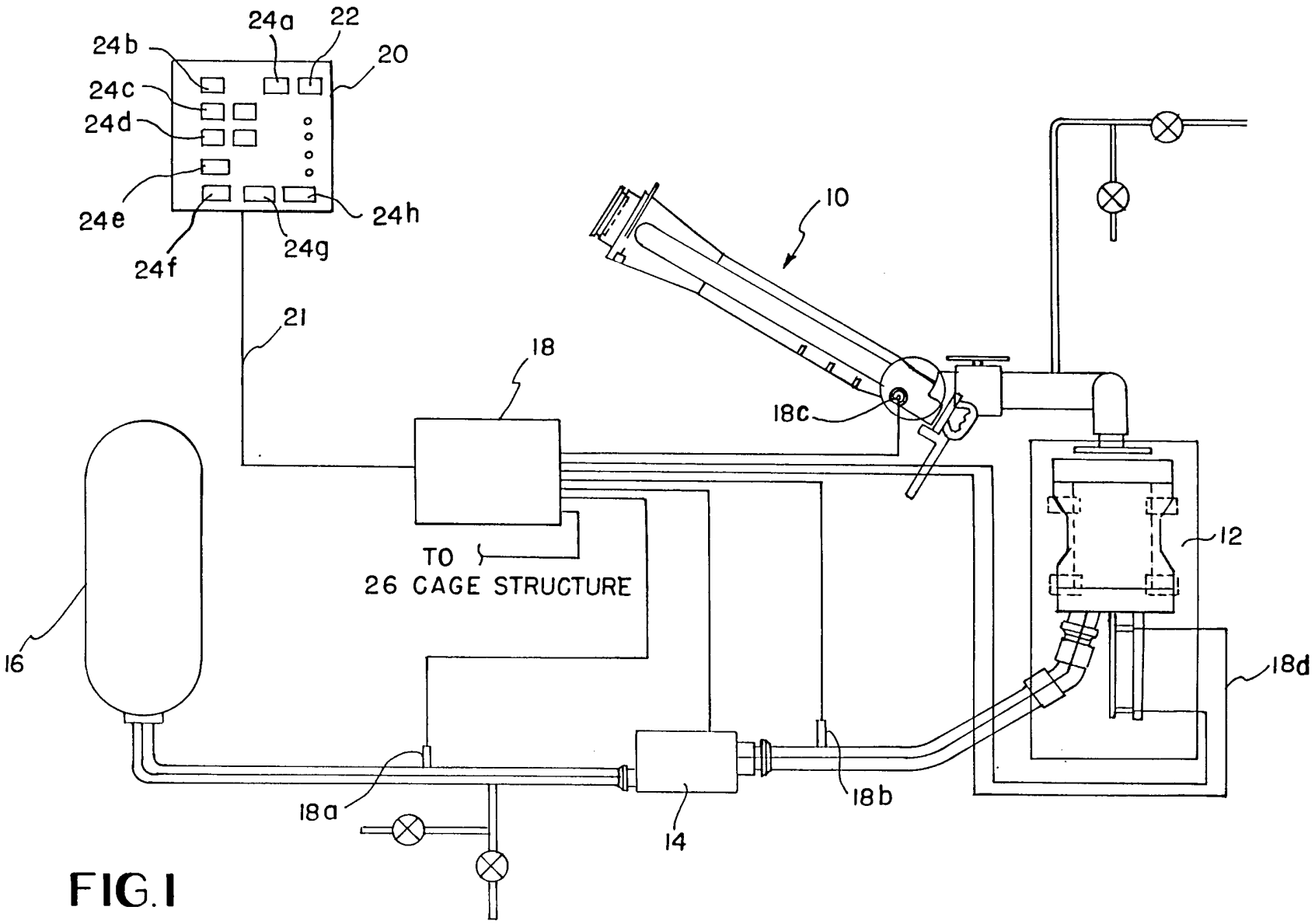
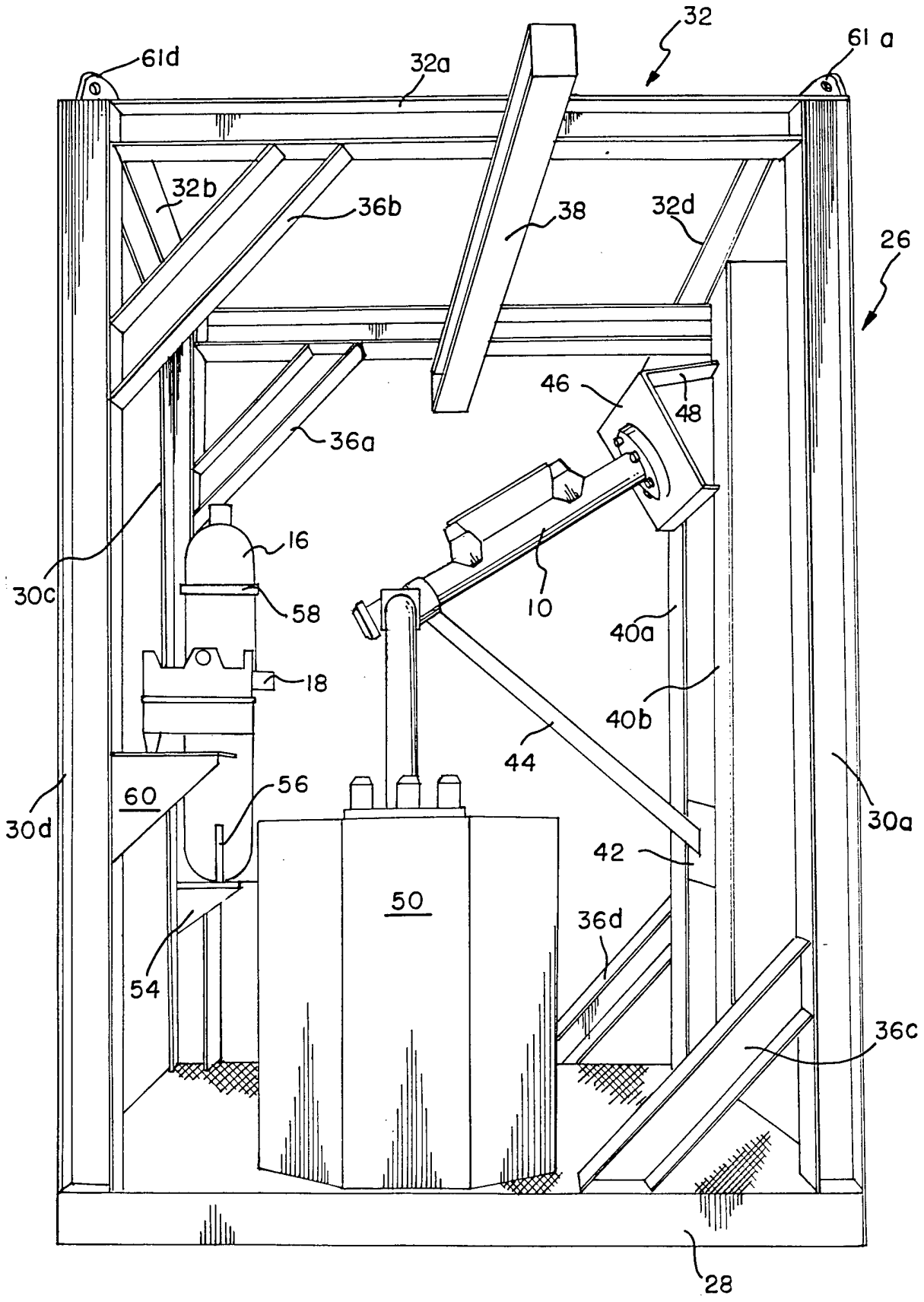

24a
22
24b
20
24c
24d
24e
24f
24g
24h
21
18
10
18c
12
TO
26 CAGE STRUCTURE
16
18d
18a
18b
14

FIG.1


32
61d
61a
32a
32b
36b
38
32d
26
46
48
36a
16
30c
58
10
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40b
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60
56
30d
30a
42
50
36d
54
36c
28

FIG. 2

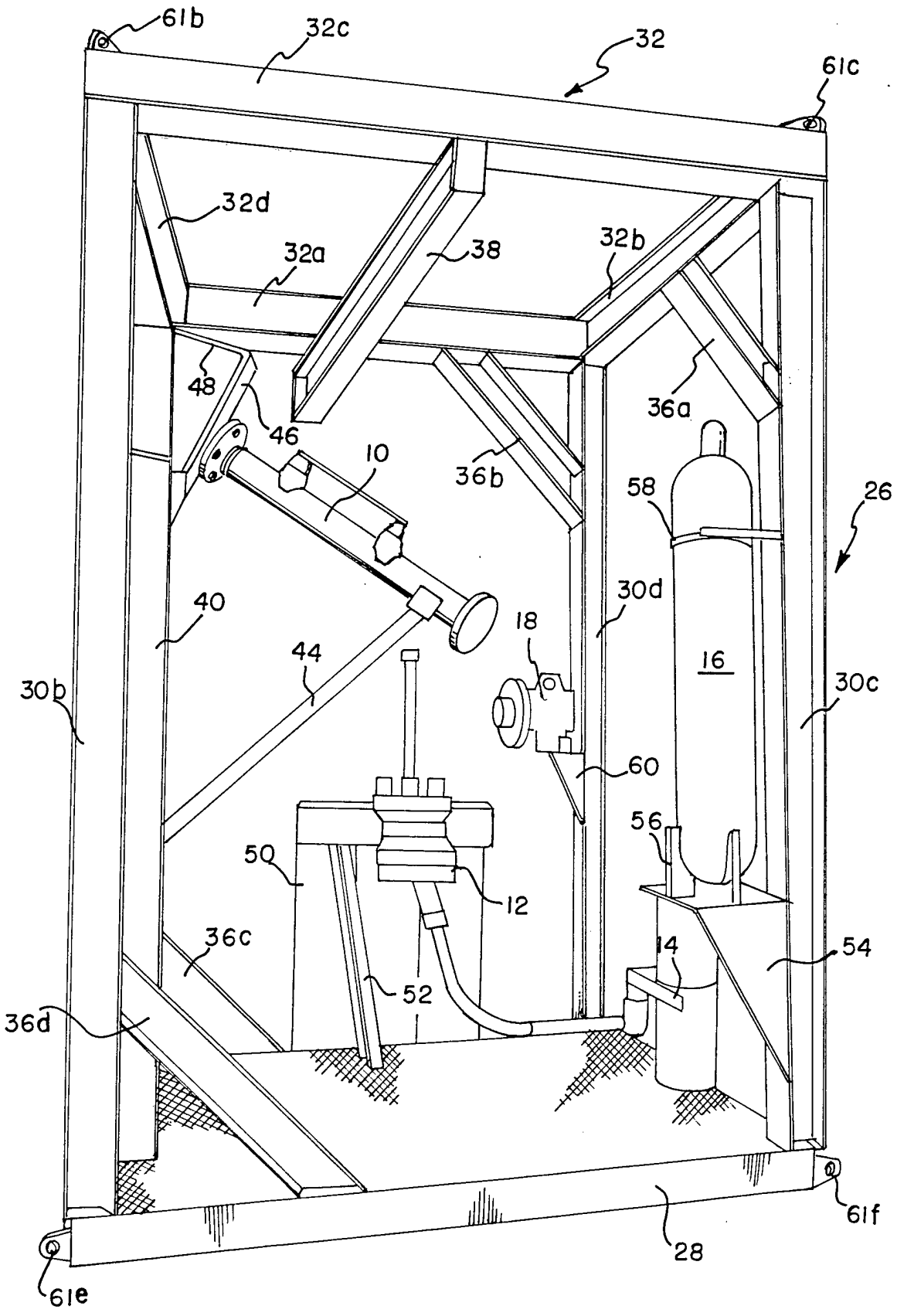
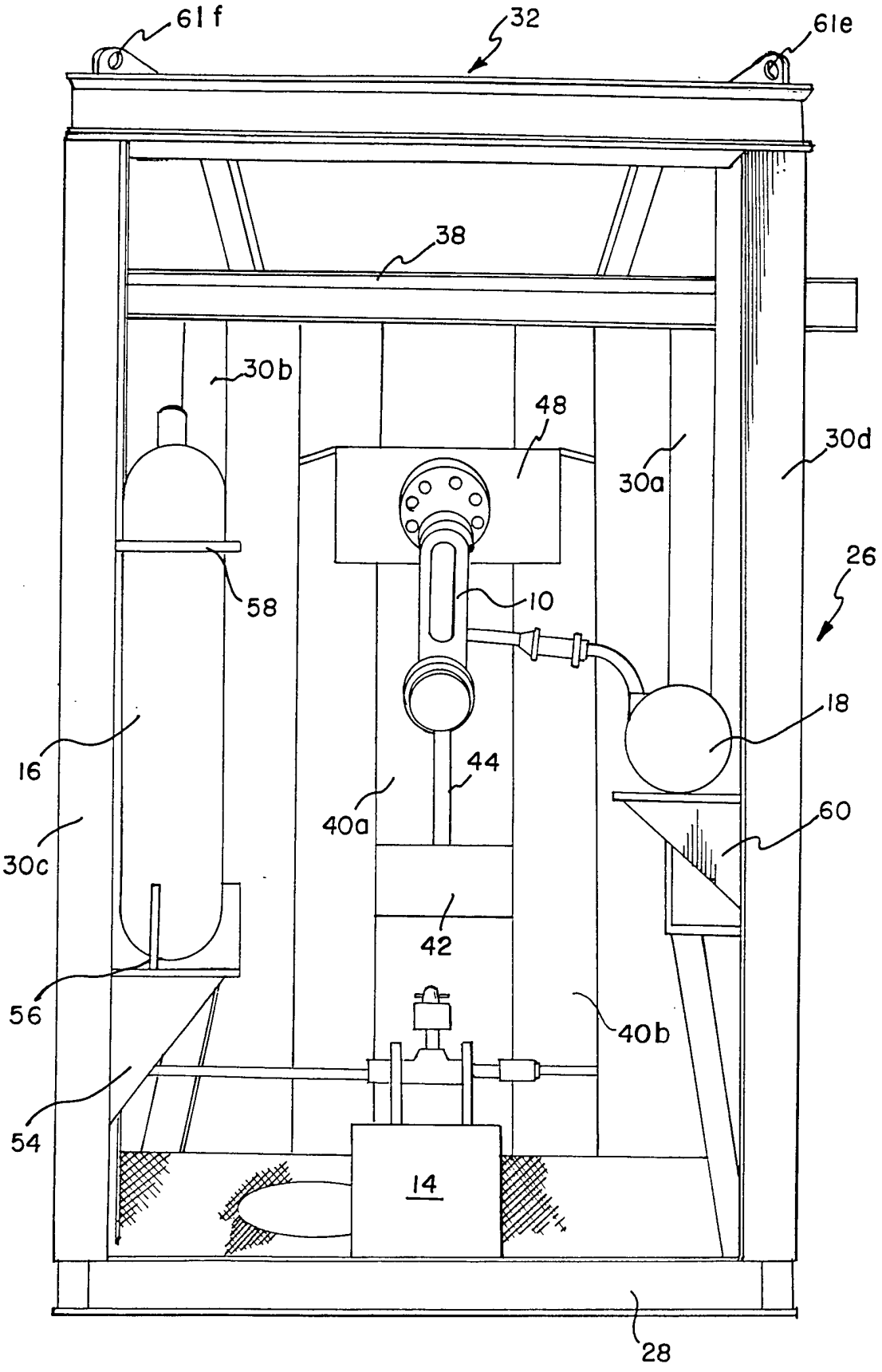

61b
32c
32
61c
32d
32a
38
32b
48
46
10
36b
36a
58
26
40
30d
18
44
16
30b
30c
60
56
50
12
36c
14
54
52
36d
61f
28
61e

FIG. 3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32
61e
38
30b
48
30a
30d
26
58
10
18
16
44
40a
60
30c
42
56
40b
54
14
28

FIG. 4