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Dragonu, deceased et al.

[54] MULTI-SONOBUOY LAUNCH CONTAINER WITH FLUID ACTUATOR

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[73] Assignee: **The United States of America as represented by the Secretary of the Navy,** Washington, D.C.

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[51] **Int. Cl.**[5] **B64D 1/04**

[52] **U.S. Cl.** **89/1.51;** 89/1.81

[58] **Field of Search** 89/1.51, 1.57, 1.81; 102/338, 340, 342, 351, 357, 438, 505; 244/137.1

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,608,131	8/1952	Pearce	89/1.51
2,707,904	5/1955	Strunk et al.	89/1.51
2,723,093	4/1955	Price et al.	89/1.51
3,618,450	11/1971	Fink et al.	89/1.51
3,787,012	1/1974	Jakubowski	89/1.51
4,164,887	8/1979	Ouellette	89/1.51
4,397,433	8/1983	Guitaut et al.	89/1.51
4,444,085	4/1984	Dragonuk	89/1.51

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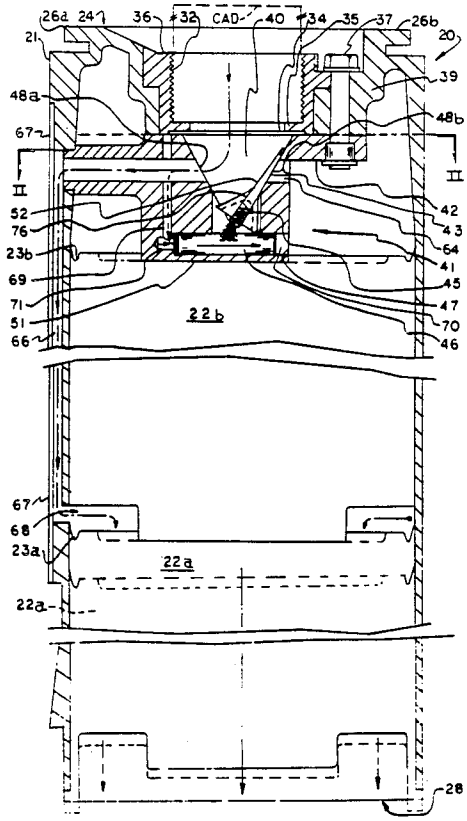
[57] **ABSTRACT**

A multi-store launch container is disclosed wherein a plurality of stores, maintained in a tandem configuration therein, can be sequentially ejected. The container is normally carried by a vehicle and receives the necessary charges, of for instance pressurized gas, at its breach end through apparatus known in the art. A fluid-controlled flow valve maintains an open flow pathway through a first channel while blocking the opening to a second channel. After the first charge is fired, the diverter mechanism forces the flow valve to pivot and tightly shut the first primary channel and open the second primary channel to receive the next charge.

5 Claims, 5 Drawing Sheets



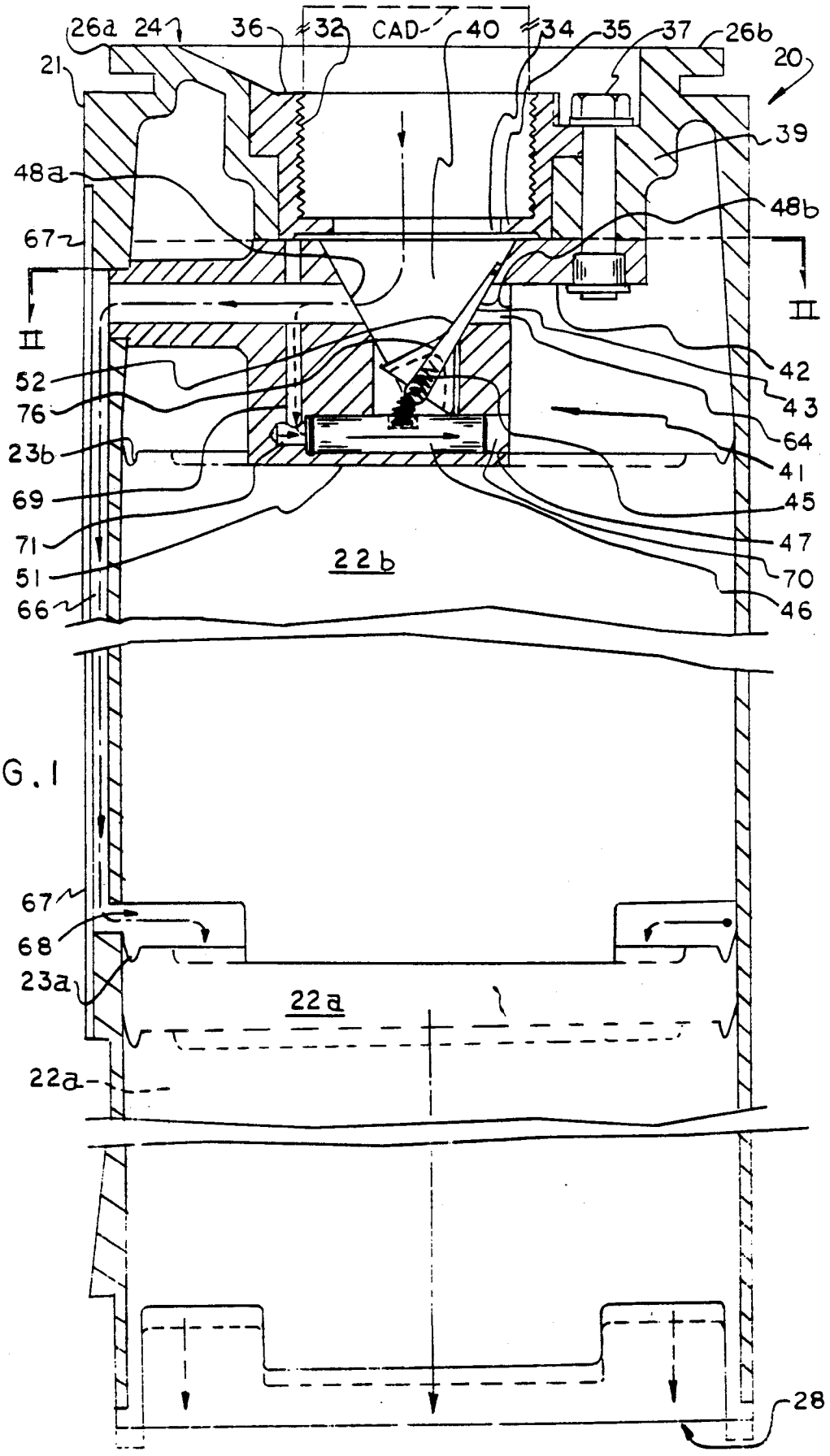

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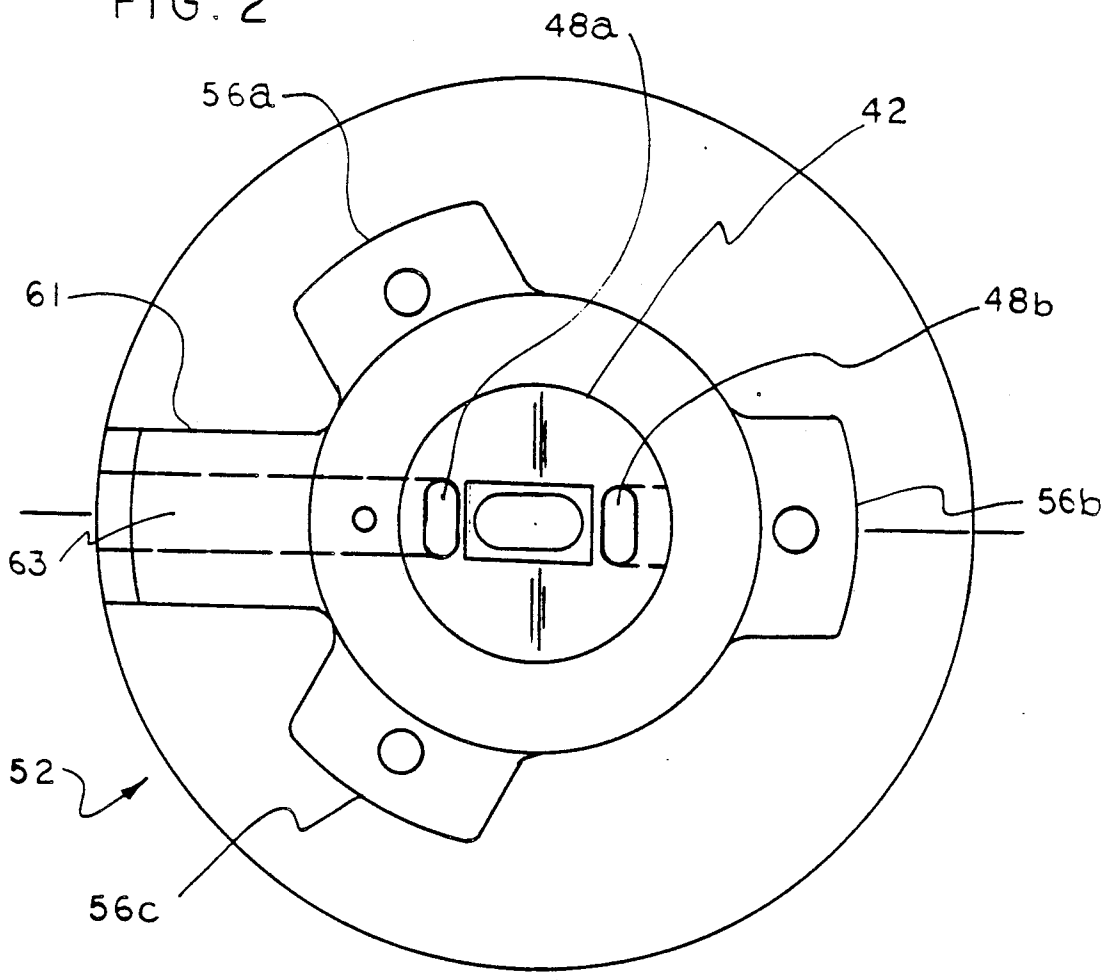
FIG. 1

FIG. 2



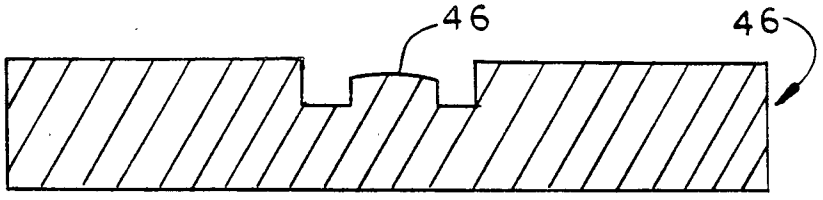


FIG. 6

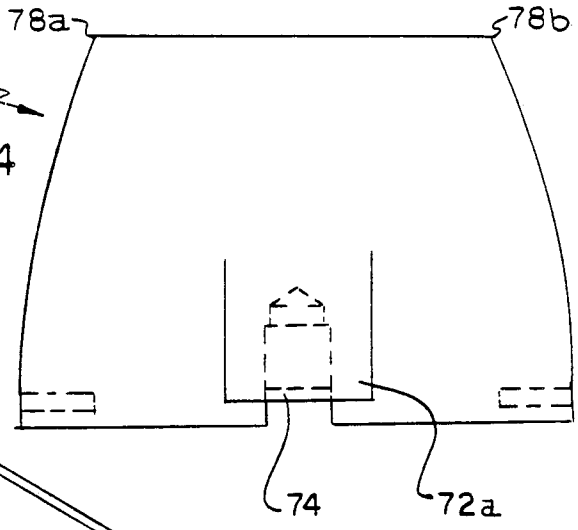


FIG.4

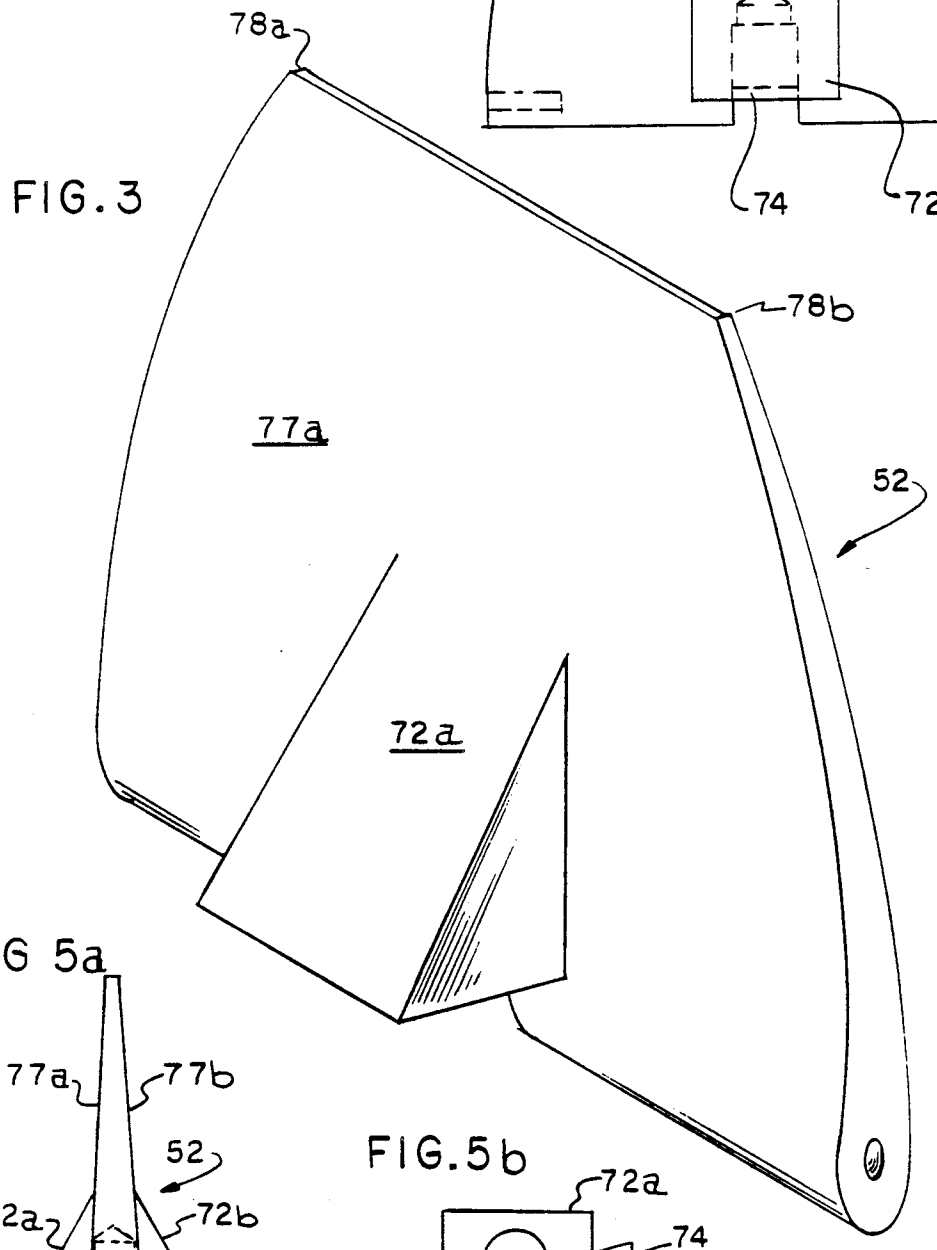
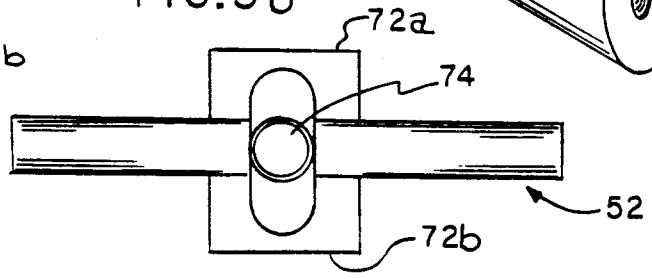


FIG.3

FIG 5a

FIG.5b



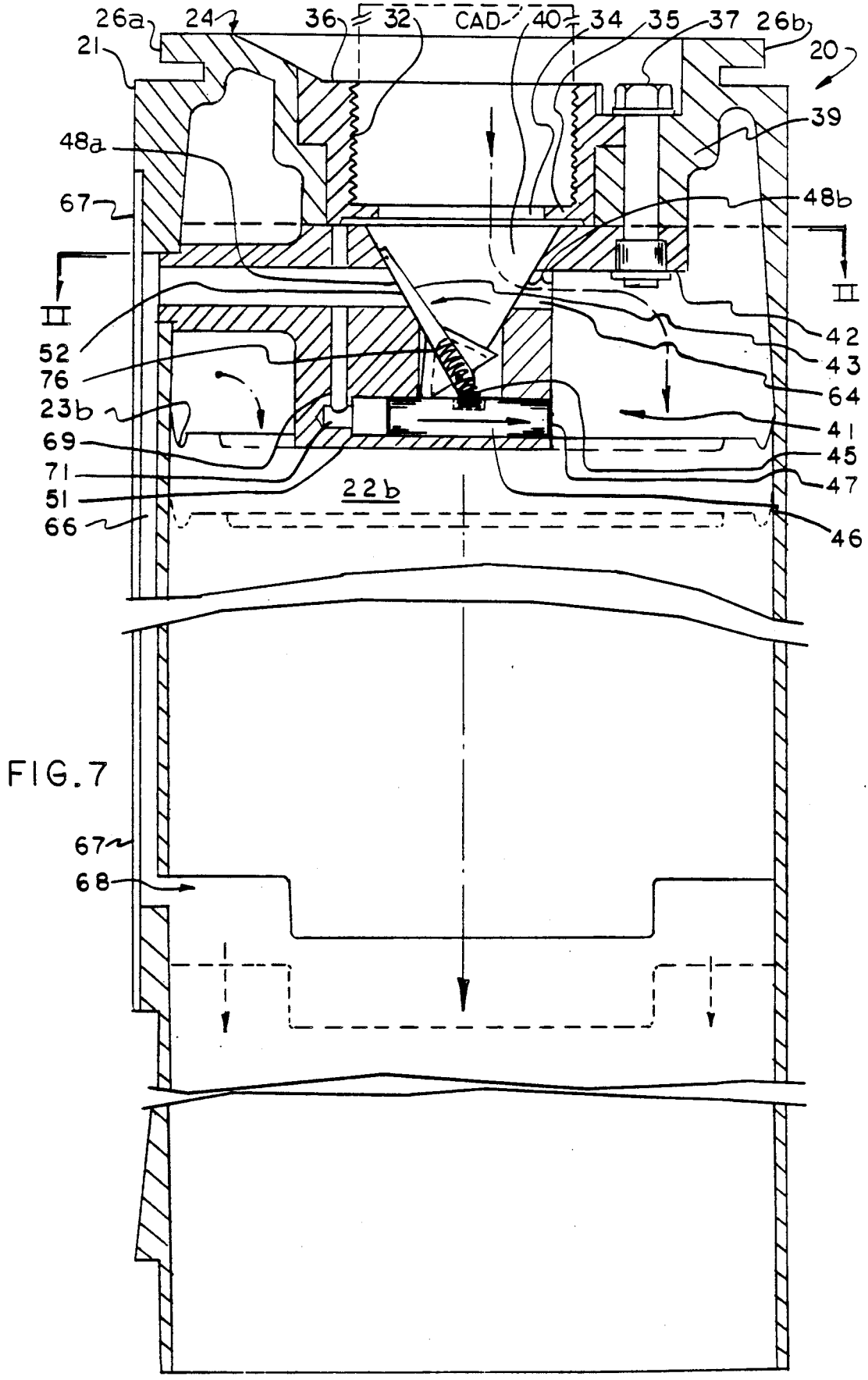

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FIG. 7

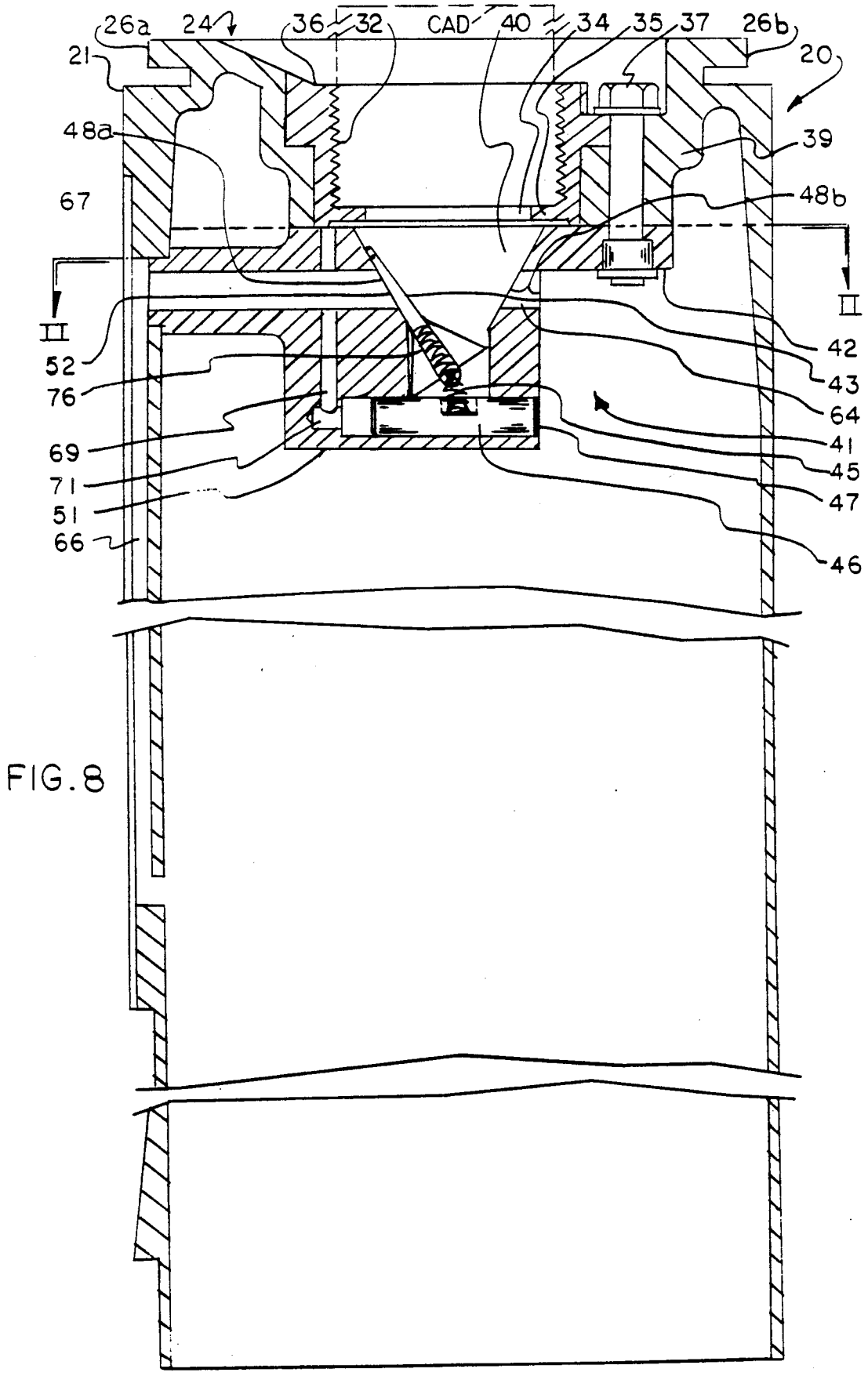
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FIG. 8

MULTI-SONOBUOY LAUNCH CONTAINER WITH FLUID ACTUATOR

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

The present invention discloses a fluid-actuated multi-store dispenser wherein a fluid activated flow controller causes sequential launching of stores from their tandem position inside a launch container. In some environments, it is desirable to dispense multiple stores, for instance sonobuoys, in dense patterns. Due to physical limitations of space in the dispensing vehicle, an effort was made to miniaturize the active components inside the store and therefore reduce the overall outer dimensions thereof. Once the size of the store was reduced, in order to meet the demands of the denser patterns, the inside of the individual launch containers had to be modified to allow each to hold and dispense more than one store. Any new type of launch container, in addition to maintaining the size requirement dictated by the transporting vehicle, must be operated by the vehicle's pneumatic gas and electrical systems.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to develop an internal mechanism that will allow the carriage and dispensing of a plurality of stores from within a single launch container.

It is a further object of the invention to develop such an internal mechanism that can easily be retrofitted into the existing inventory of launch containers.

It is a still further object of the present invention to develop an internal mechanism that will permit the carriage and dispensing of a plurality of stores from within a single container without interfering with the safety or the reliability of either the dispensing vehicle or the container.

It is a still further object of the present invention to develop such an internal mechanism that will be relatively simple to manufacture, install and maintain.

These and other objects of the invention are accomplished by a tubular store launch container, that is installed in a vehicle to receive a fluid charge into its breech end and that contains a fluid-directing flow valve, at least two fluid channels for directing the fluid charge and a diverter mechanism that alternatingly covers first one channel and then the other. The stores are loaded into the container in tandem positions and a multi-channel flow valve pre-set to open access to a first, primary pathway and to close access to a second, primary pathway. Additionally, access is opened to a flow valve diverter pathway. The stores are removably sealed into the container to form an airtight package. At a predetermined signal, a first charge of gas flows into the flow valve, down the primary pathway and impacts against the inner end of the last-loaded store. Pressurized flow also travels into the flow diverter pathway and forces a diverter cylinder across a predetermined distance. The movement of this cylinder unbalances a spring force and the resulting spring restoration force moves the valve from the second primary channel over to the first, thereby resulting in the closing of the first and opening of the second. Whenever the vehicle is ready to dispense the second store, a second charge will now flow through the second, primary pathway to the second store and against the inner surface thereof to force it from the container.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a cross-sectional elevation view of a launch container, modified by the instant invention, with two stores contained therein and after a first charge has been fired;

FIG. **2** shows a cross-sectional view, taken along lines II—II of FIG. **1**, showing a view of the upper, inside of the breach end of the launch container when the flow valve assembly has been removed;

FIG. **3** shows an isolated and enlarged perspective view of a part of the flow valve shown in FIG. **1**;

FIG. **4** shows a front view of the flow valve shown in FIG. **3**;

FIG. **5***a* shows a left-side view of the flow valve shown in FIG. **3**;

FIG. **5***b* shows a bottom view of the flow valve shown in FIG. **3**;

FIG. **6** shows an isolated cross-sectional view of the piston cylinder of FIG. **1**;

FIG. **7** shows a cross-sectional elevation view, similar to FIG. **1**, after one store has been ejected and depicting a second charge (shown by the dashed arrow) firing the innermost store; and

FIG. **8** shows a view similar to FIG. **6** depicting the resulting empty launch container after all stores have been ejected.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein like characters designate like or corresponding parts throughout the several views, there is shown in FIG. **1**, a cross-sectional elevation view of a standard-size launch container **20**, connected into the transporting vehicle (not shown in FIG. **1**), with two stores **22***a*, **22***b* contained therein and after a first fluid charge (denoted by the fluid flow dashed arrows) has been fired from the vehicle. The charge can be either a pneumatic gas charge, such as is detailed in U.S. Pat. No. 4,444,085 which is incorporated herein by reference, or an explosive charge from what is commonly called a cartridge-activated-device, or CAD, as is known in the art. Launch container **20** is connected to the transport vehicle at its breach end **24** by locking lugs **26***a*, **26***b* being inserted into receptacles (not shown) in the vehicle, as is known, to thereby leave its discharge end **28** open to the environment. Launch container **20** can be made from molded ABS plastic or aluminum sheet, formed into a tubular sleeve of predetermined diameter and length, with the components at the breach end, as will be more fully described below, being made from molded plastic or other suitable materials. FIG. **2** shows a sectional view of launch container **20** taken along lines II—II of FIG. **1**, showing container **20** with the breach end cap **21** removed.

A plenum chamber **32** to receive fluid charges, in the form of a cup, with a fluid charge aperture **34** through the central portion of the bottom **35**, is affixed inside the breach end **24** of cap **21**, as by one or more fasteners **37**. The charge supplying mechanism (such as, for instance, a CAD, as shown in phantom) can be conveniently

attached thereto, as by mating threads therefrom to the threads **36** on the inner surface of the chamber walls. Fasteners **37**, for instance a bolt and nut combination shown in FIG. **1**, fix the side tab **39** of chamber **32** to cap **21** and to flow valve means **41**. Valve means **41** is rigidly secured, near the breach end, to the inside of container **20**, as shown, and consists of a flow valve housing **42**, a centrally-located flow valve **43** connected by a biasing means, such as a spring **45**, to a piston cylinder **46** that reciprocates inside of aperture **47**, a radially-located securing section to capture fastener **37** and oppositely-extending port sections **48***a*, **48***b*. The bottom peripheral edge and surface **51** of housing **42** provides a charge-deflecting guide to properly direct the charge around the outer perimeter of the innermost store to bring the firing force to bear evenly on the store as it is discharged from container **20**. Each store **22***b*, **22***a* is inserted inside container **20** so that its upper rim **23***b*, **23***a*, respectively, forms a hermetic seal, to be broken only when sufficient charge pressure accumulates, between the inner surface of the walls of container **20** and the rim. If desired, a disc of foam padding can be inserted atop each store (not shown) to prevent damage to the top surface thereof while the store is being carried in container **20**. Charge collection chamber **40**, situated immediately below plenum chamber **32**, collects the charge and allows it to be diverted to different ports, such as port **48***a* or port **48***b*, as will be described.

Two of the key components of the present invention are the flow valve means **41** and the attached piston cylinder mechanism **46**, **47**, both shown in FIG. **1** in their initial positions. Flow valve means **41** is comprised of spring-loaded flow valve **52**, as shown in separate views in FIGS. **3**, **4**, **5***a* and **5***b* and housing **42** for twin ports **48***a* and **48***b*, shown more clearly in FIG. **2**. Valve **52**, as seen in cross-section in FIG. **1** and in a plan view in FIG. **2**, is essentially in the shape of a right circular cylinder with a conical collection chamber **40** oriented at the central axis thereof. It has a wing section **61** extending from its central section, and section **61** carries a channel **63** to define a flow path port **48***a* for the first fluid charge, as will be discussed. As can be seen in FIG. **2**, valve **52** has three extension tabs **56***a*, **56***b* and **56***c* to receive fasteners **37** and thereby secure cap **21** to housing **52**. Valve **52** is fixedly held inside container **20** so that channel **63** is aligned with a passageway **66** along a predefined corridor extending longitudinally inside launch container shell **67**. Passageway **66** connects channel **63** with an aperture **68** in the side wall of container **20** for a purpose to be explained. In a similar fashion, a much shorter channel **64** leads from port **48***b* to a unique open area immediately adjacent the top surface of store **22***b*, and a smaller channel **69** branches off from channel **63**, as seen in FIG. **1**. Channel **69** connects the fluid flow channel **63** to an area immediately adjacent cylinder **46**. Cylinder **46** slidingly fits into passageway **70** where it can reciprocate from one side to the other.

Valve **52**, as can be seen more clearly in FIGS. **3**, **4**, **5***a* and **5***b*, is a relatively flat, semi-rectangular shaped device that has a centrally located pyramidal, or thickened, part **72***a*,**72***b* at the bottom or proximal end. A hollowed-out inner section in part **72***a*, *b* contains a guiding ring **74** that captures the upper end of a compression spring **76**. The other end of spring **76** is fixedly held by cylinder **46**, by projection **46***a*, as seen in FIG. **6**, and the spring **76** keeps valve **52** a predetermined distance above the upper surface of cylinder **46**. Opposite sides **77***a*, **77***b* of valve **52** are ground flat and towards the distal end, are tapered at the corners **78***a*, **78***b*. Valve **52** is connected to spring **76**, which, in turn, is connected to projection **46***a* on cylinder **46**. Cylinder **46** is initially set adjacent the end of channel **69** to imbalance, and make off-center, the location of the upper end of spring **76**, which is fixed inside valve **52**. This imbalance causes valve **52** to be forced against, and sealingly cover, port **48***b*, as shown in FIG. **1**. As will be explained, the opposite sides **77***a*, **77***b* of valve **52** alternatingly seal ports **48***a*, **48***b* as fluid charges move cylinder **46**.

The action and reaction of the multi-store launch container can be more easily understood with reference to FIGS. **1**, **7** and **8**. Launch container **20** is loaded with first store **22***b* and then store **22***a*.

When the first charge (as depicted by the dashed arrows) enters plenum chamber **32** and then collection chamber **45**, it is free to only proceed through port **48***a* and out channel **63** and down channel **66**. Valve **52** is initially closed over port **48***b* and the pressure from the first charge causes it to remain in that position, where it continues to cover port **48***b*. The charge will be forced down the corridor that is channel **66** and through aperture **68** and to the unique area around the perimeter of store **22***a*. The pressure from the charge will build until it is sufficient to overcome shear tabs (not shown) that are holding store **22***a* inside container **20**. Store **22***a* will leave container **20** (as shown by the arrows at the lower end thereof depicting movement and the phantom lines showing store **22***a* in a second position). Additionally, a portion of this first charge will also move through channel **69** to the small bore **71** adjacent cylinder **46**, and once sufficient pressure has built up in this area, start to move, or reciprocate, cylinder **46** to the opposite end of passageway **70**. The movement of cylinder **46** shifts projection **46***a*, which causes a further contortion of spring **76**. Due to the natural restoring spring force in spring **76**, and due to the fact that cylinder **46** is heavier than valve **52**, the upper end of spring **76** reacts to the contortion by tending to move to the opposite side of chamber **40** to completely close, and seal, port **48***a*, thereby completely opening port **48***b*, as seen in FIG. **7**. The flat surface **77***a* of valve **52** conforms to the edges of port **48***a*. Now that port **48***b* is open, and port **48***a* is closed, a subsequent charge (as seen by the dashed arrows in FIG. **7**) will flow through plenum chamber **32**, into chamber **40** and out through port **48***b*. This charge will be diverted, once it reaches the inner surface of store **22***b*, by ring **46** to flow over the surface of the perimeter of store **22***b*. once sufficient pressure, to overcome shear tabs (not shown) constraining store **22***b* inside container **20**, builds up, the tabs will be broken and store **22***b* will be ejected. The empty launch container **20** is shown in FIG. **8**.

Obviously, other embodiments and modifications of the present invention will readily come to those of ordinary skill in the art having the benefit of the teachings presented in the foregoing description and drawings. It is therefore to be understood that various changes in the details, materials, steps, and arrangements of parts, which have been described and illustrated to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What I claim is:

1. A fluid-activated launcher system, connected to receive fluid charges, for sequentially ejecting stores

releasably held in tandem position in a launch container, comprising:

a. a launch tube, having a breach end and a discharge end, loaded with a plurality of stores for ejection through the discharge end;

b. fluid producing means connected to said breach end to produce predetermined charges of fluid into said launch tube; and

c. flow valve means comprising

a plurality of channels, each said channel connecting said fluid producing means to a unique area adjacent a store;

channel cover means pivotally connected to oscillate from a sealing position over a first primary channel to a sealing position over a second primary channel; and

biasing means connected to said channel cover means to exert a predetermined force on said channel cover means connected to said fluid producing means to selectively divert the fluid charges to impact, sequentially, said plurality of stores.

2. A launcher system as described in claim 1 wherein said biasing means consists of a fluid-activated cylinder and a spring.

3. A launcher system as described in claim 2 wherein said fluid-activated cylinder reciprocates in a cylinder passageway adjacent said flow valve means.

4. A launcher system as described in claim 1 wherein said channel cover means comprises a flat, rectangular-shaped section.

5. A fluid-activated launch container for sequentially dispensing a plurality of stores, connected to receive a plurality of fluid charges, comprising:

a. a launch tube, having a breach end connected to a carrying craft to receive fluid charges and an oppositely-disposed discharge end, and being loaded with a plurality of stores for ejection through the discharge end;

b. a charge accumulation and distribution area;

c. a plurality of ports adjacent said area, each said port leading, through a separate channel, to a unique area adjacent one of said plurality of stores;

d. a cylinder to slidingly reciprocate from end to end in a passageway; and

e. a valve cover biasingly mounted to said cylinder.

* * * * *