Jan. 10, 1961 E. M. STORMA ET AL 2,967,631

METHOD AND APPARATUS FOR UNDERWATER LOADING OF A WATER VESSEL

Filed April 26, 1957 3 Sheets-Sheet 1

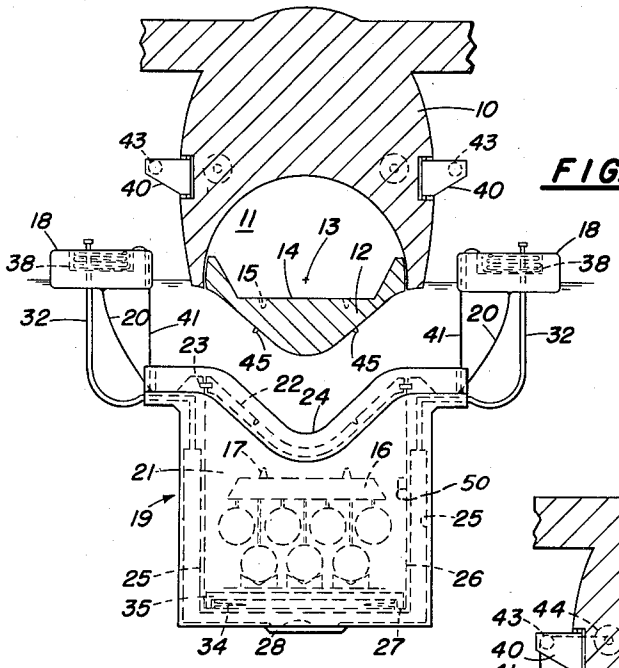


FIG. 1

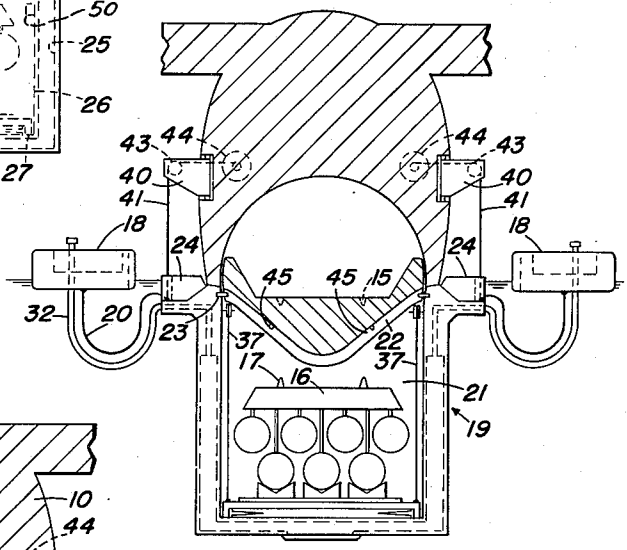


FIG. 2

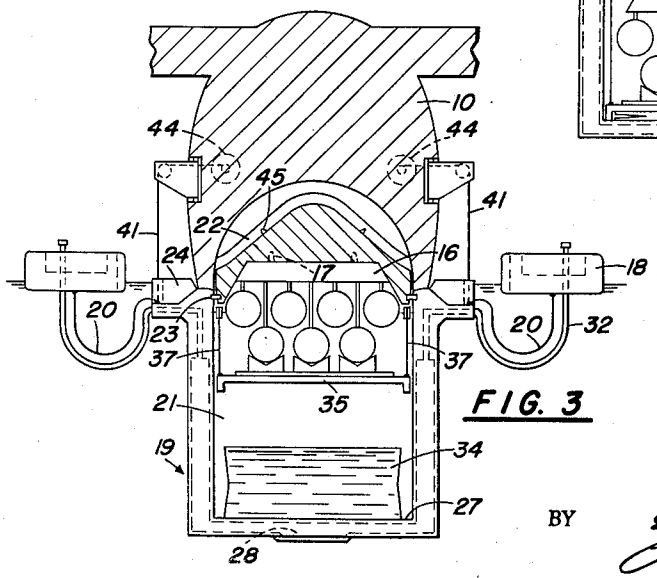


FIG. 3

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FIG. 5

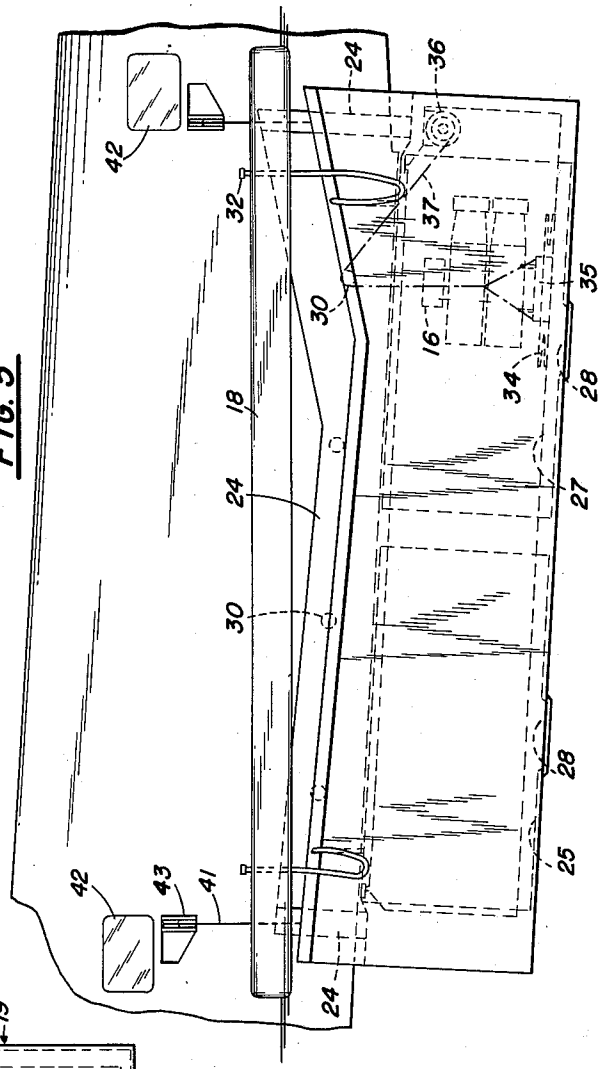
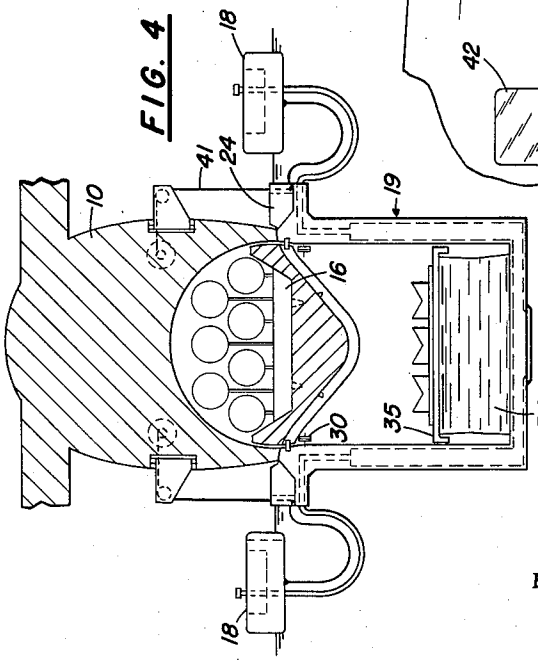


FIG. 4



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METHOD AND APPARATUS FOR UNDERWATER LOADING OF A WATER VESSEL

Filed April 26, 1957 3 Sheets-Sheet 3

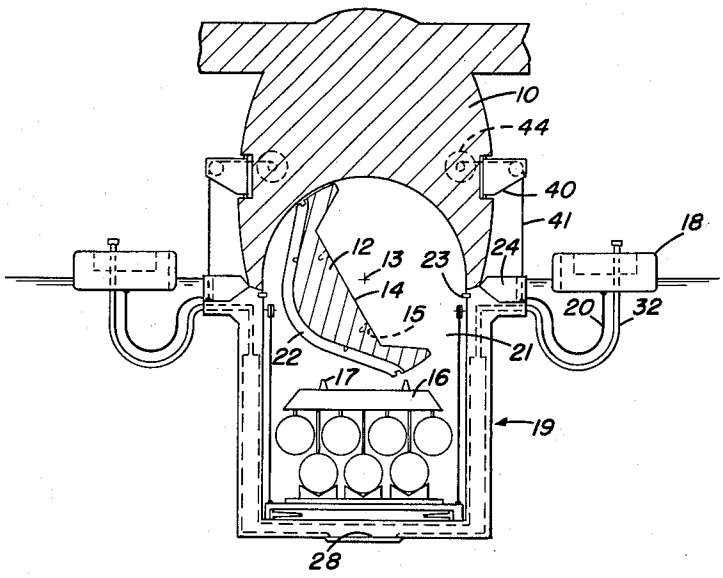


FIG. 6

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United States Patent Office 2,967,631 Patented Jan. 10, 1961

2,967,631

METHOD AND APPARATUS FOR UNDERWATER LOADING OF A WATER VESSEL

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Filed Apr. 26, 1957, Ser. No. 655,455

9 Claims. (Cl. 214—13)

The present invention is a method of and apparatus for underwater loading of a water vessel and more particularly to a method and apparatus for underwater loading of a water vessel having a rotary door.

In the past, water vessels were loaded while afloat through either a crown hatch or a side door provided in the vessel. With these systems of loading, the vessels preferably carried their own loading equipment.

In smaller vessels such as seaplanes, the door or hatch cannot be made large enough, for structural reasons, to allow large stores to be loaded through them. Also, the time involved in loading a vessel having a crown hatch or side door loading system is lengthy, and such systems are not designed for fast loading as required by water vessels in time of war. Therefore, these systems have the disadvantages set forth above and are not suitable for use in connection with a seaplane that must be reloaded while afloat under wartime conditions.

One of the main missions of a seaplane during wartime is to restrict the movements of enemy surface ships and submarines. To effectively carry out this mission, the seaplane must be completely operative from a water base and it must possess the ability to be rearmed or reloaded quickly while afloat. The rearming operation may occur in the open water or shallows, in sheltered regions or forward battle areas: for maximum effectiveness of the seaplane, it should be capable of being loaded rapidly at such sites, and require only a minimum amount of equipment at the site. Until the advent of the present invention, a method meeting these requirements did not exist.

The method and apparatus of the present invention are to be used in conjunction with a seaplane having a rotary (bomb) bay door of the type disclosed in Patent No. 2,634,656, issued to Woollens et al., April 14, 1953.

An object of the present invention is the provision of a method and apparatus for underwater loading of a water vessel having a rotary door while afloat.

Another object is to provide a method and apparatus for underwater loading and unloading of a water vessel while afloat with a minimum amount of time and equipment.

A further object of the invention is the provision of a method and apparatus for underwater loading of a water vessel while afloat which allows large single stores or a plurality of stores to be loaded.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

Fig. 1 is a cross-sectional view of a seaplane, with a caisson in elevation therebelow, both diagrammatically shown.

Figs. 2, 3, and 4 are similar views, showing the parts in different sequential positions, and with the front end wall of the caisson removed.

Fig. 5 shows a side view of the apparatus shown in Fig. 2, with the fore and aft sections of the seaplane cut off.

Fig. 6 is a cross-sectional view similar to Figs. 1 through 4 showing the door in a partially open position.

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a transverse section of a seaplane **10** afloat having a bay **11** closed by a door **12** which is rotatably mounted about an axis **13**, preferably in the manner described in aforementioned Patent No. 2,634,656. The door **12** has an interior surface **14** which is provided with self-locking female fittings **15** for attaching a loaded carrier **16** having male conical fittings **17** to the door **12**.

In Fig. 1, the seaplane **10** is positioned between a pair of buoys **18** which support a submerged caisson **19** by means of support cables **20**. The caisson **19** is placed at a predetermined location prior to the arrival of the aircraft.

The caisson **19** has a waterproof stowage compartment **21** having an open top which is closed by a waterproof cover **22**. The cover **22** is shaped to match the contour of the rotary door **12**. A releasable rigid seal **23** encircles the cover **22** and engages the side walls of the opening to the stowage compartment **21**.

The caisson **19** is provided with a partially inflatable bumper-seal **24** which extends around the cover **22**. The bumper-seal **24** protects the seaplane **10** and the caisson **19** from damage when they engage and forms a watertight seal between the two during loading operations.

Ballast tanks **25** are mounted in the side walls **26** and floor **27** of the caisson **19**. The ballast tanks **25** have ports **28** extending through the bottom of the caisson **19**.

The tanks **25** are provided with any suitable system for filling them with water. In the system shown, conduits **32** are connected to the upper ends of the tanks **25**, and have their upper ends supported by the buoys **18**. This allows water to enter into the tanks **25** through the ports **28** thus sinking the caisson **19** until it is supported by the buoys **18**.

The conduits **32** also fill up with water. To refloat the caisson **19**, tanks **25** are blown out by compressed air forced through the conduits **32**. The caisson **19** would thus rise to the surface of the water and float until hauled aboard a vessel or re-loaded while afloat.

As best seen in Fig. 5, the floor **27** of the stowage compartment **21** in the caisson **19** supports a collapsible ballast bag **34** which communicates with ballast tanks **25**. A hoisting platform **35** is mounted on the bag **34** and supports the loaded carrier **16**.

A winch **36** having a cable **37** (Fig. 5) is mounted at one end of the caisson **19**. A plurality of hoisting pulleys **30** are mounted in the top of the compartment **21**.

The buoys **18** have stowage lockers **38** therein which store hoisting cables **41** (Fig. 1) attached to the caisson **19**.

After the seaplane **10** has taxied between the buoys **18**, the hoisting cables **41** are picked up by means of a boat hook or the like, from a hatch **42** (Fig. 5) in the seaplane **10**. The cables **41** are then fed through the hoist pulleys **43** (Fig. 2) which are journaled in pivotably mounted brackets **40** on the seaplane **10**. The cables **41** are attached to internal hoists **44** and the caisson **19** is then raised by means of hoists **44** until the bumper-seal **24** is in water tight engagement with the hull of the seaplane **10**.

The outer surface of the door **12** is provided with hooks **45** and as shown in Fig. 2, when the caisson **19** is tight against the hull of the seaplane **10**, the hooks **45** engage the cover **22** thus locking the cover **22** to the door **12**. The releasable rigid seal **23** is then released

from engagement with the walls of the caisson **19** and the cover **22** is free to rotate with the rotary door **12**.

The door **12** is then rotated into the position shown in Fig. 3 carrying the cover **22** with it. The door **12** can be rotated into a parially open position to permit a crewman to enter the waterproofed and now completely continuous loading chamber formed by the mating of compartment **21** of the caisson **19** and the bay **11** of the seaplane **10**. The door **12** is shown in such a position in Fig. 6. With the door in this position, lighting for the caisson is furnished by lights installed in the bay **11** and fresh air can be ducted in.

After entering the compartment **21** in the caisson **19**, the crewman attaches the winch cable **37** to the platform **35**, as shown in Fig. 5.

By means of the winch **36**, the loaded carrier **16** is raised until the male conical fittings **17** engage the self-locking female fittings **15** in the door **12** to automatically lock the loaded carrier **16** to the interior surface **14** of the door **12**, shown in Fig. 3. Also, in Fig. 3, the bag **34** is shown in its expanded position as water enters the bag **34** once the platform **35** and loaded carrier **16** are raised. The water in bag **34** replaces the weight of the loaded carrier **16** being transferred from the caisson **19**, the weight of the water approximating the weight of the loaded carrier **16**. Thus, the caisson **19** is stabilized during loading.

When the hoisting operation is complete and the loaded carrier **16** is securely locked to the door **12**, as preferably indicated by a signal light in a bombing panel, the crewman in the compartment **21** lowers the platform down on the expanded bag **24** (Fig. 4) and leaves through the space that exists when the rotary door **12** is in the partially open or 45 degree position, shown in Fig. 6.

To complete the loading operation, the door **12** is rotated to the closed position as shown in Fig. 4, the rigid seal **23** re-engaged with the caisson walls, and the cover **22** detached from the door **12** and attached by the rigid seal **23** to the caisson walls. The hoisting cables **41** are then slackened and the caisson **19** is allowed to sink away from the seaplane **10**. When the caisson **19** is entirely supported by the buoys **18** and cables **20**, the cables **41** are detached from the hoists **44** and pulleys **43** and returned to the lockers **38** in the buoys **18**, and the seaplane taxis from between the buoys **18**.

A master connector **50** for electrical circuitry is plugged into the loaded carrier location: the details thereof form no part of the present invention, a suitable arrangement being disclosed in the above mentioned patent. Arming wires and lanyards are attached after the door **12** is rotated to the closed position.

This entire operation requires only a short period of time to complete. The period depends largely on the condition of the sea and the experience of the handling crew.

Although, the caisson can be of any desired size, it must be heavy enough to have a slight negative buoyance when it is empty.

The buoys **18** serve four purposes: supporting the submerged caisson **19**; marking the caisson's location; storing the hoisting cable **41** in its locker **38**; and supporting air lines **32**.

It should be understood that a plurality of loaded carriers can be carried in the caisson **19** and fixed to the door **12**. This can best be seen in Fig. 5, wherein space is provided for four carriers of the size illustrated.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An apparatus for underwater loading a water vessel afloat comprising a water vessel afloat having a hull, a bay within said hull closed by a rotary door, a submerged waterproof caisson having a chamber therein open at the top for encompassing said rotary door, a cover closing said chamber and having substantially the same configuration as the exterior surface of said door, means encircling said cover for releasably sealing said cover to said caisson, stores in said chamber adapted to be fastened to the interior surface of said door, means on the exterior surface of said door for securing said cover thereto, means on the interior surface of said door for locking said stores thereto, and means operatively connected to said water vessel and said caisson for raising said caisson into engagement with the hull of said water vessel.

2. The combination set forth in claim 1 and hoisting means in said chamber of said caisson for raising said stores into locking engagement with the interior surface of said door.

3. The combination set forth in claim 2 and at least one buoy on the surface of the water, a cable connecting said buoy to said caisson whereby the buoy supports the caisson when the caisson is detached from said raising means.

4. The combination set forth in claim 2, and bumper-seal means encircling the upper end of said caisson for cushioning and sealing the caisson when it engages the hull of the water vessel.

5. In an apparatus for loading a water vessel having a bay closed by a rotary underwater door, said bay having a longitudinal axis and a transverse axis, means for rotating said rotary door around an axis which lies in any plane parallel to the plane containing said longitudinal axis and said transverse axis, a waterproof caisson having a chamber therein open at the top for encompassing said rotary door, a cover closing said chamber and having substantially the same configuration as the exterior surface of the door of the water vessel, and means for releasably sealing said cover to the upper end of said caisson and means for securing said cover to said door so that after the cover is released it will rotate with said door thereby enabling a load to be transferred from said chamber to said bay.

6. The combination set forth in claim 5 and further comprising ballast tanks in said chamber for making and breaking communication between said chamber and said bay.

7. The combination set forth in claim 5 and hoisting means in said chamber for raising stores adapted to be fastened to the door of the water vessel.

8. The combination set forth in claim 6 and further comprising at least one buoy floating on the surface of the water, means communicating with said tanks and positioned on said buoy for blowing out the tanks when the caisson is to be elevated.

9. An apparatus for underwater loading a water vessel comprising a water vessel having a hull, a bay within said hull, a rotary door forming part of said hull for opening and closing said bay, a submerged waterproof caisson having a chamber therein open at the top for encompassing said rotary door, a cover closing said chamber and having substantially the same configuration as the exterior surface of said door, means for releasably sealing said cover to said caisson, a load within said chamber adapted to be fastened to the interior surface of said door, means on the exterior surface of said door for securing said cover thereto, means on the interior surface of said door for locking said load thereto, and means operatively connected to said water vessel and said caisson for raising said caisson into engagement with the hull of said water vessel so that the chamber in said caisson and the bay in said water vessel are placed in communication with each other.

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CERTIFICATION OF CORRECTION

Patent No. 2,967,631 January 10, 1961

Edward M. Storma et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 14, after "vessel" and before the period insert -- so that said stores can be transferred from the chamber in said caisson to the bay in said water vessel --.

Signed and sealed this 18th day of July 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
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