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**US-A- 3 135 427**  
**US-A- 4 032 037**  
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**US-A- 5 178 320**  
**US-A- 5 218 784**  
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# **DESCRIPTION**

## **BACKGROUND OF INVENTION**

### **Field of the Invention**

**[0001]** The invention relates generally to an apparatus comprising a mud skip comprising a frame and a container for storing and transporting drilling waste. More specifically, the present invention relates to skips for storing and transporting drill cuttings and substances produced in the course of offshore drilling operations.

### **Background Art**

**[0002]** Fig. 1 shows a typical offshore drilling rig 100 having a derrick 102, a floating platform 104, and a riser 106 that extends from the offshore drilling rig 100 down to the seabed 110. In drilling operations, particularly in the drilling of oil and gas wells large amounts of waste material is generated when drilling a wellbore 108 in an earth formation. The waste material generated is also known as drill cuttings. Drill cuttings may comprise, for example, rock, dirt, shale, and other debris. Drilling fluid ("drilling mud") is often pumped downhole for a number of different purposes, such as lubrication of the drill string within the riser 106, prevention of corrosion, and transport of drill cuttings to the surface. Drilling fluid may be oil or water-based, although oil-based drilling fluids are preferred in lower sections of bore, and are also generally less costly than water-based drilling fluids.

**[0003]** Once the drilling fluid is returned to the surface, it is passed through screens, vibratory separators, or other filtering arrangements to separate the waste material and drill cuttings from the drilling fluid. The drilling fluid may then be sent to a reservoir or returned to the system and reused. Drilling cuttings processed by filtering arrangements may contain approximately 10% to 20% moisture (oil, water) by weight. Because the waste material and drill cuttings contain contaminants, such as chemicals, hydrocarbons such as oil, and other components hazardous to the environment, environmental regulations require that the waste material and drill cuttings be processed and disposed of in an environmentally acceptable manner. Contaminated waste material and drill cuttings recovered from an offshore drilling rig typically require removal from the rig or wellbore for treatment on land to decontaminate them before they can be safely disposed.

**[0004]** The waste material and drill cuttings are collected and stored on the drilling platform 114 or vessel in small containers, also known as mud skips, skips, or cuttings boxes, before being transported onshore for processing. The skips may be lifted by a crane 112 and loaded on a ship 116, or supply boat, for transportation to a shore base facility. The skips typically have about a five ton capacity and a typical drilling operation may produce up to 800 ton of drilling waste. Many skips are necessary on a typical drilling rig to handle the large amounts of drill cuttings generated. Dedicated crews are necessary to handle the skips on the drilling and at the shore base facility, cleaning crews are necessary to clean the skips after each use, and crews are needed to address safety and environmental concerns in each operation handling the skips.

**[0005]** Figs. 2 and 3 show examples of typical mud skips 220 having a lid 222 coupled to the top 224 of the tank 220. A plurality of lifting eyes 228 are coupled to the tank 220. The lifting eyes 228 are configured to receive a hook (not shown) for lifting the tank 220 with a crane 112 (Fig. 1). Additionally, the tank 220 has slots 230 that allow the tank 220 to be lifted or transported by, for example, a forklift. The lid 222 is coupled to the top 224 of the tank 220 by one or more hinges 226 (also shown in Fig. 4). As shown in Figs. 3 and 5, the lid 222 is manually opened by standing on the top 224 of the skip 220 and lifting on the on the side 230 opposite the hinged 226 side.

**[0006]** As shown in Fig. 6, after the lid 222 on the skip 220 is manually opened, waste material and drill cuttings separated from the drilling fluid are discharged from a separator 232 into the skip 220. The separator 232 may be disposed in a structure 234 that allows the separator to be positioned above the skip 220. Once the skip 220 is full, as viewed through, for example, a portal 236 disposed on the top 224 of the skip 220, the lid 222 may be closed and moved to a storage location on the drilling platform 114 (Fig. 1) or to a ship 116 (Fig. 1) for transportation onshore. Corresponding locks 238 on the lid 222 and the top 224 of the skip 220 secure the lid in the locked position to prevent leaks or spills of the drill cuttings during transportation.

**[0007]** Typically, mud skips for offshore drilling rigs range in size from 2384 L (15 barrel (bbl)) containers to 3974 L (25 bbl) containers. The skips may be comprised of galvanized steel that is internally coated for corrosion resistance. A skip, when empty,

may range in weight from approximately 3000 lbs (1300 kg) to 4500 lbs (2000 kg) or more. The size of a skip may also vary based on the space available on a drilling platform for storage and the amount of drill cuttings produced. For example, a skip may vary in size from approximately 2.28 m (7.5 ft) long by 1.37 m (4.5 ft) wide by 1.21 m (4 ft high) to 2.43 m (8 ft) long by 2.43 m (8 ft) wide by 1.21 m (4 ft high) or larger. Accordingly, the gross total weight and capacity of each skip varies due to the variation in empty weight and size of the skip. The lids of the skips are also extremely heavy so as to provide a greater seal of the skip opening. Typically, a lid may weigh several hundred pounds or more. The heavy weight of the lids and the position of the operator atop the skip often present a safety concern for personnel when opening and closing the lids. Further, the lids are typically only safely secured in a fully open or fully closed position.

[0008] US 6,003,705 relates to a portable bulk storage container having a counterweight mechanism for opening and closing a lid such that the counterweight does not extend beyond the base or top of the storage container. More specifically, because bulk containers are designed to be stored next to one another and to be stacked, the counterweight does not extend beyond, i.e. outside, the base or the top rail of the frame of the bulk container.

[0009] US 5,218,784 relates to bins utilized on farms and in industry for storing grain or other aggregate materials. More specifically, a lid assembly having on one side thereof a hinge assembly and on a diametrically opposite side thereof a latch assembly, is provided. In addition, pivotably mounted on the same pivot axis with the lid is a lever arm.

[0010] US 3,135,427 relates to a charging hopper for automatic balances for the weighing of fine grained loose bulk material. More specifically, a lever arm is disposed approximately perpendicular to a hinged wall, the lever arm having a counter-weight mounted so that the end of the weight part is adjustable.

[0011] US 5,011,036 relates to a front-end loading refuse bin providing a foot operable lid to allow two handed placement of trash in the bin. More specifically, a swing arm pivotally secured to each side wall is described wherein the forward end of the swing arm terminates in a counterweight and a pedal.

[0012] Accordingly, there exists a need to effectively and safely seal and store drill cuttings and waste material in mud skips.

## SUMMARY OF INVENTION

[0013] The invention discloses an apparatus according to claim 1 comprising a container configured to store and transport drilling waste, a lid coupled to the container, and at least one arm coupled to the lid and configured to lift or lower the lid when moved, wherein the at least one arm comprises a counterweight.

[0014] Other aspects and advantages of the invention will be apparent from the following description and the appended claims.

## BRIEF DESCRIPTION OF DRAWINGS

### [0015]

FIG. 1 shows a conventional offshore drilling rig.

FIG. 2 shows a conventional mud skip.

FIG. 3 shows another conventional mud skip.

FIG. 4 shows a hinge of lid of a mud skip, which is not of the invention.

FIG. 5 shows a hinged lid of a mud skip, which is not part of the invention.

FIG. 6 shows a conventional mud skip being filled.

FIG. 7 shows a side view of a mud skip, which is not part of the invention.

FIG. 8 shows a front view of a mud skip, which is not part of the invention.

FIG. 9 shows a top view of a mud skip, which is not part of the invention.

FIG. 10 shows a side view of a mud skip in accordance with the invention.

#### DETAILED DESCRIPTION

**[0016]** The invention relates to an apparatus comprising a mud skip, wherein the mud skip comprises a storage container for drilling waste. In particular, disclosed embodiments provide an arm coupled to a lid of a mud skip for moving and securing the lid. The arm comprises a counterweight that reduces the amount of force or weight necessary to move the heavy lids open or closed. In another embodiment, the arm, in conjunction with an arm lock, secures the lid in open or closed positions by varying increments. Accordingly, embodiments of the present invention provide a safer and more effective mud skip.

**[0017]** Figs. 7-9 which are not part of the invention show a mud skip 730. The mud skip 730 comprises a container 728 and a frame 729 that provides support and mobility to the mud skip 730. A lid 732 is coupled to the top 734 of the mud skip 730. The container 728 and the lid 732 may be formed from any material known in the art for forming containers for storing drilling waste. For example, the container 728 and the lid 732 may be formed of galvanized steel. Further, the container 728 may be internally coated with a corrosion resistant material. The lid 732 may be coupled by any means known in the art. For example, at least one hinge 944 (Fig. 9) may couple the lid 732 to the top 734 of the mud skip 730. At least one arm 736, or lid key, is coupled to the lid 732 on the hinged side 738 of the lid 732. A second arm 736a may be coupled to the lid 732 of the mud skip 730 on the side opposite the arm 736 and oriented in a similar manner as arm 736.

**[0018]** The arm 736 may be coupled to the lid 732 by any method known in the art for safely securing two load bearing pieces together. For example, the at least one arm 736 may be bolted to the lid 732. Alternatively, the at least one arm 736 may be welded to the lid 732. The at least one arm 736 may be releasably coupled to the lid 732. The at least one arm 736 may be coupled to the lid 732 to lift or lower the lid 732 and then released and removed from the lid 732 when not in use. In this example, the at least one arm 736 used to lift and lower the lid 732 of a first mud skip may be removed and used to lift and lower a lid of a second mud skip. Additionally, the releasable coupling of the at least one arm 736 with the lid 732 allows the operator to remove the at least one arm 736 from lid 732 of the mud skip 730 to prevent interference of or damage to the arm 736 when mud skips are transported or stacked on top of one another.

**[0019]** The at least one arm 736 may comprise at least two sections 750, 752 (shown in Fig. 8) that may be integrally or separately formed, so long as the first section 750 and the second section 752 form a rigid junction. In the example shown in Figs. 7, 8, and 9, the first section 750 of the at least one arm 736 extends out laterally from the mud skip 730 along the axis of the hinged side 738 of the lid 732 and past the outer side edge 942 of the container 728. The second section 752 of the at least one arm 736 extends downwardly towards the base 740 of the mud skip 730. One of ordinary skill in the art will appreciate that the at least one arm 736 may be formed so that a first section extends across the width of the lid 732 past both sides of the container and two side sections may be disposed on either side of the container and formed in the same manner as the second section 752 of the at least one arm 736. The second section 752 may extend downwardly at an angle "A" defined between the axis of the second section 752 of the at least one arm 736 and an axis formed perpendicular to the axis of the first section 750 of the at least one arm 736. In one embodiment, angle A may be between 0 and 90 degrees. For example, when the lid 732 is in the closed position, the second section 752 of the at least one arm 736 may extend downwardly at an angle A of approximately 50 degrees.

**[0020]** The second section 752 of the at least one arm 736 may comprise a counterweight that accounts for the weight of the lid 732. The weight of the counterweight is such that when the second section 752 of the at least one arm 736 is moved forward, as indicated at F, the lid 732 may be lifted open, indicated at O. Accordingly, the second section 752 may be moved backward, indicated at B, to close the lid 732. The counterweight may be integrally formed with the second section 752. For example, the second section 752 of the at least one arm 736 may be formed of a dense material in a selected size and shape, thereby providing sufficient weight to reduce the force or weight required to open the lid 732. The arm 736 may be formed of any material known in that art such that the arm may withstand the weight and movement of the lid 732. Alternatively, additional masses or weights may be coupled to the second section 752 of the at least one arm to provide sufficient weight to reduce the force or weight required to open the lid 732.

**[0021]** According to the invention a second section 1052 of the at least one arm 736 extends upwardly away from the base 740 of the mud skip 730, as shown in Fig. 10. The second section 1052 of the at least one arm 736 is moved backward, indicated at B, thereby moving the lid 732 open, indicated at O. To close the lid 732, the second section 1052 is moved forward, indicated at F. At least one groove is formed on the bottom 1066 of the container 728 to accommodate the upwardly extending second section 1052 of the at least one arm 736 when multiple skips are stacked on top of one another. The second section 1052 disposed in

the groove of a skip stacked on top of the mud skip 1030 prevents the stacked skip from moving or sliding off of the base skip 1030.

**[0022]** In this alternative embodiment, the second section 1052 of the at least one arm 736 comprises a counterweight that accounts for the weight of the lid 732. In this embodiment, the weight of the counterweight is such that when the second section 1052 of the at least one arm 736 is moved backward, as indicated at B, the lid 732 is lifted open, indicated at O. Accordingly, the second section 1052 is moved forward, indicated at F, to close the lid 732. In one embodiment, the counterweight may be integrally formed with the second section 1052. For example, the second section 1052 of the at least one arm 736 may be formed of a dense material in a selected size and shape, thereby providing sufficient weight to reduce the force or weight required to open the lid 732. The arm 736 may be formed of any material known in that art such that the arm may withstand the weight and movement of the lid 732. Alternatively, additional masses or weights may be coupled to the second section 1052 of the at least one arm to provide sufficient weight to reduce the force or weight required to open the lid 732.

**[0023]** Figs. 7-9, which are not part of the invention, show an example of the mud skip 730 further comprising an arm lock 754. At least one arm 736 may be engaged with the arm lock 754 at pre-selected locations, thereby securing the lid 732 open or closed at corresponding varying increments. The arm lock 754 may comprise a plate 758 coupled to the outer side wall 760 of the container 728. Several locking holes 756, for example, threaded holes, may be formed in the plate 758 so as to provide pre-selected locking locations. As at least one arm 736 is moved forward F, the operator may lock the at least one arm 736 into a selected location 756 by securing a locking device (not shown), for example, a bolt, screw, or other similar structure, through the arm 736 and into the location 756, thereby securing the lid 732 open or closed at a corresponding increment. The plate 758 may be curved so as to maintain alignment with the locking device coupled to the arm 736. One of ordinary skill will appreciate that other arm locks coupled to the at least one arm 736 for securing the at least one arm 736 at pre-selected locations, thereby securing the lid 732 open or closed at varying increments may be used without departing from the scope of the invention.

**[0024]** Similarly, Fig. 10 shows an embodiment of the mud skip 1030 further comprising an arm lock 1054. In this embodiment, at least one arm 736 may be engaged with the arm lock 1054 at pre-selected locations, thereby securing the lid 732 open or closed at corresponding varying increments. In one embodiment, the arm lock 1054 may comprise a plate 1058 coupled to the top 734 of the container 728. In this embodiment, several locking holes 1056, for example, threaded holes, may be formed in the plate 1058 so as to provide pre-selected locking locations. As at least one arm 736 is moved backward B, the operator may lock the at least one arm 736 into a selected location 1056 by securing a locking device (not shown), for example, a bolt, screw, or other similar structure, through the arm 736 and into the location 1056, thereby securing the lid 732 open or closed at a corresponding increment. In this embodiment, the plate 1058 may be curved so as to maintain alignment with the locking device coupled to the arm 736. One of ordinary skill will appreciate that other arm locks coupled to the at least one arm 736 for securing the at least one arm 736 at pre-selected locations, thereby securing the lid 732 open or closed at varying increments may be used without departing from the scope of the invention.

**[0025]** Typically, an operator must stand on top of the mud skip 730 to lift the lid 732. To lift the lid it may take 140 lbs (65 kg) of weight or more, as may be determined by a mechanical suspended scale. In contrast, examples disclosed herein, for example, shown in Figs. 7-9, which are not part of the invention, allow the operator to stand next to the mud skip 730 and push at least one arm 736 forward to lift the lid 732 open with less force or weight than required to lift the lid separately. For example, wherein the weight of the lid 732 would typically require 140 lbs (65 kg) to lift in the conventional manner, in the example shown in Fig. 7, which is not part of the invention, the weight required to move the arm 736 forward and thereby open the lid 732, is approximately 10 lbs (5kg). In another example, two operators may be positioned on opposite sides of the mud skip 730 and each push an arm 736, 736a forward, thereby lifting the lid 732 open and reducing the force or weight necessary to lift the lid 732.

**[0026]** The present invention provides a mud skip with an arm for lifting a lid of the mud skip. The present invention may reduce the risk of injury to personnel while operating mud skips. Further, the invention allows for a more securely positioned lid, in both the open and closed positions. The present invention prevents movement of skips when multiple skips are stacked.

## **REFERENCES CITED IN THE DESCRIPTION**

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

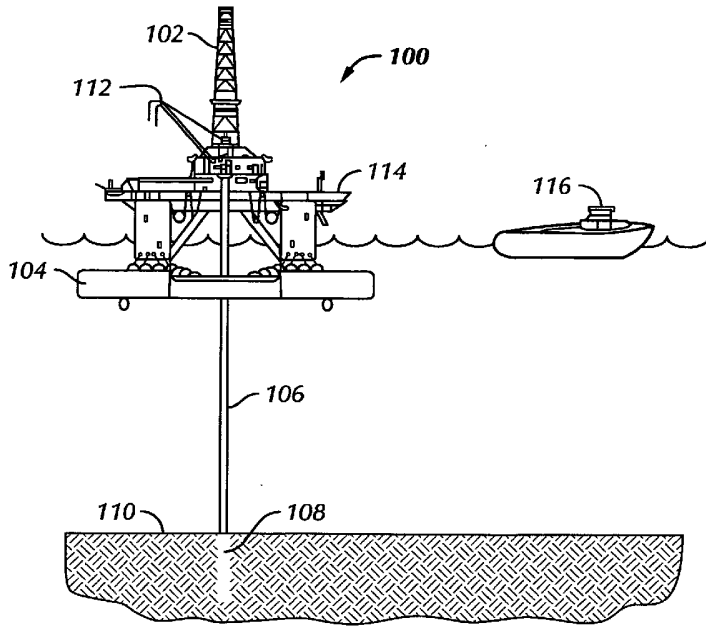
### **Patent documents cited in the description**

- US6003705A [0008]
- US5218794A [0009]
- US3135427A [0010]
- US5011036A [0011]

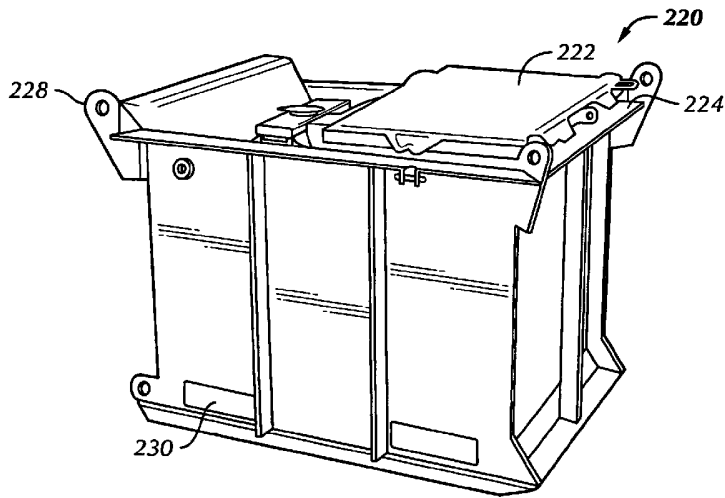
## PATENTKRAV

1. Apparat som omfatter: en mud skip (730), hvor mud skip'en omfatter en ramme (729); en container (728), som er indrettet til at lagre borerester; et låg (732), som er forbundet til containeren (728); og mindst én arm (736), som er forbundet til låget (732) og indrettet til at løfte eller sænke låget (732), når den bevæges; hvor den mindst ene arm (736) omfatter en modvægt, og hvor den mindst ene arm (736) strækker sig udad og opad forbi toppen (734) af containeren (728), hvor mud skip'en (730) er indrettet til at blive stablet med en anden mud skip, hvor containeren (728) indbefatter en rille, som er dannet på en bundflade (1066) af containeren (728) til at modtage en sektion af en arm på en anden mud skip, hvilken sektion strækker sig opad.
2. Apparat ifølge krav 1, hvor den mindst ene arm (736) er forbundet til en hængslet side (738) af låget (732).
3. Apparat ifølge krav 1, hvor modvægten er dannet som en del af den mindst ene arm (736).
4. Apparat ifølge krav 1, hvor modvægten er dannet separat og forbundet til den mindst ene arm (736).
5. Apparat ifølge krav 1, hvilket apparat yderligere omfatter mindst én armlås (1054) til at fastgøre den mindst ene arm (736) på mindst ét forud valgt sted.
6. Apparat ifølge krav 5, hvor den mindst ene armlås (1054) omfatter en plade (1058), som har låsehuller (1056), som er anbragt på det mindst ene forud valgte sted.
7. Apparat ifølge krav 6, hvilket apparat yderligere omfatter en låseindretning, som fastgør den mindst ene arm (736) på det forud valgte sted.
8. Apparat ifølge krav 1, hvor den mindst ene arm (736) er boltet til låget (732).
9. Apparat ifølge krav 1, hvor den mindst ene arm (736) er svejset til låget (732).
10. Apparat ifølge krav 1, hvor den mindst ene arm (736) er løsbart forbundet til låget (732).

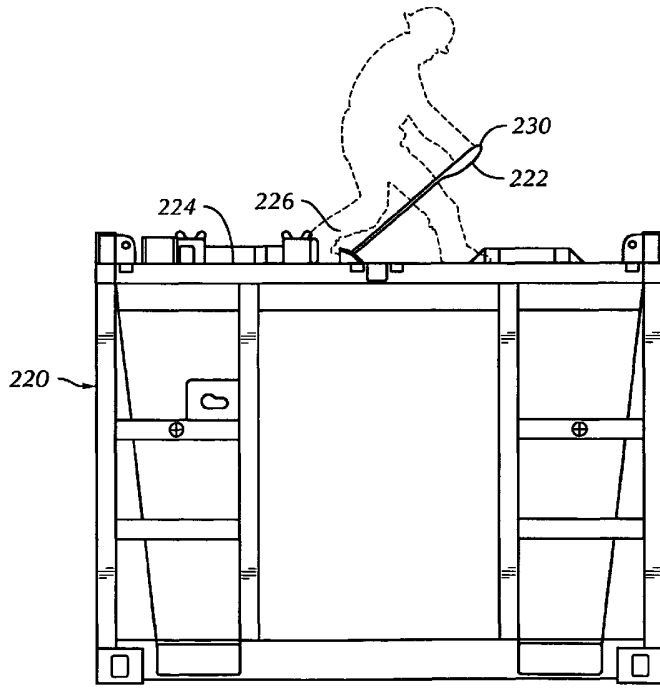
DRAWINGS



**FIG. 1**  
**(Prior Art)**



**FIG. 2**  
**(Prior Art)**



**FIG. 3**  
**(Prior Art)**

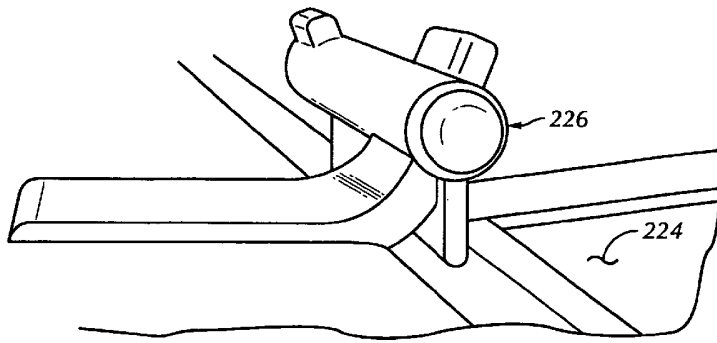


FIG. 4

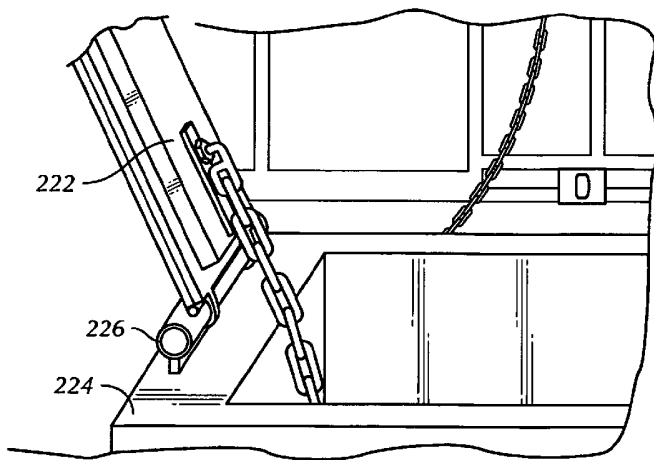


FIG. 5

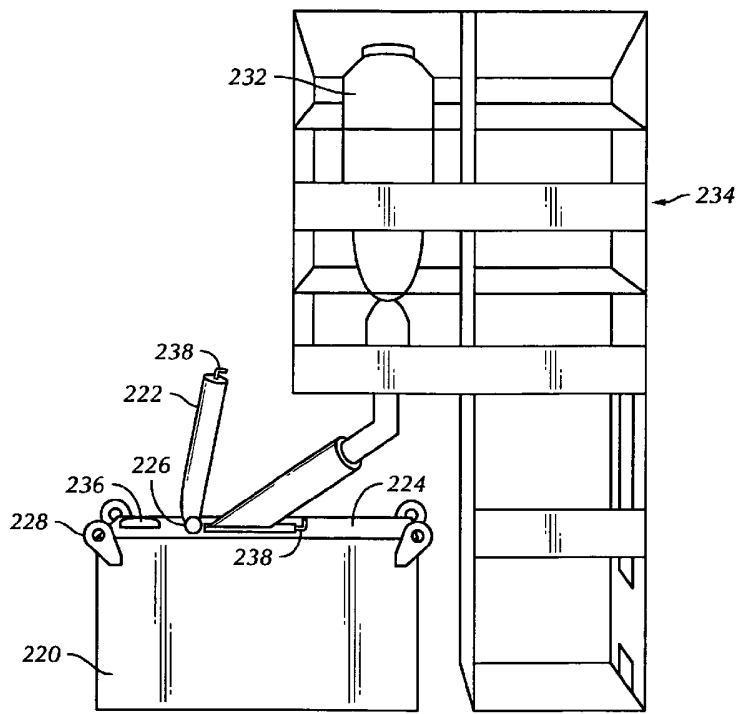


FIG. 6

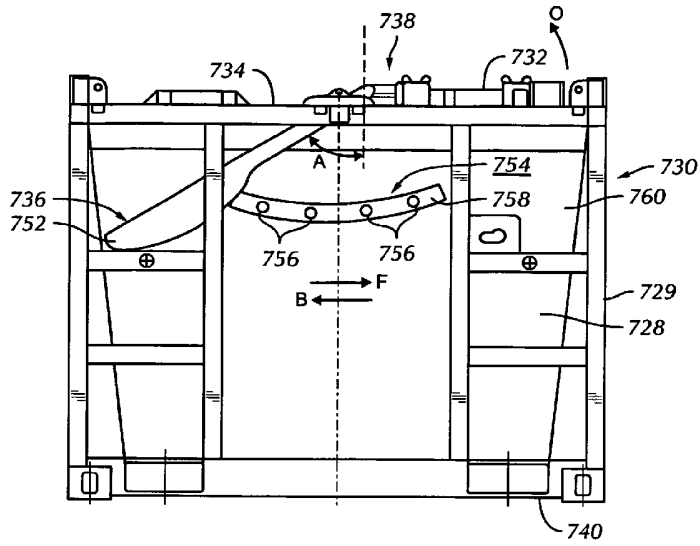


FIG. 7

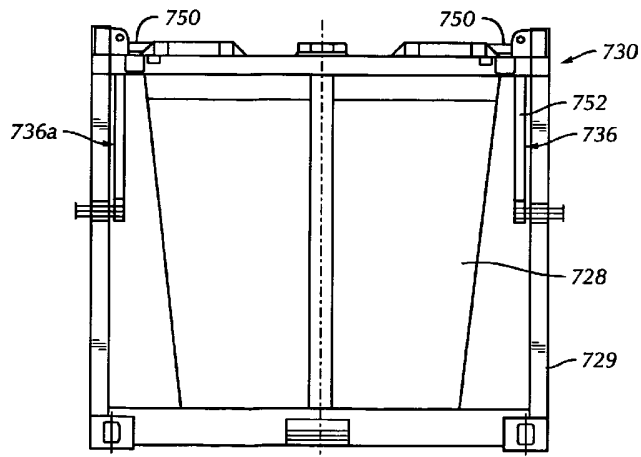


FIG. 8

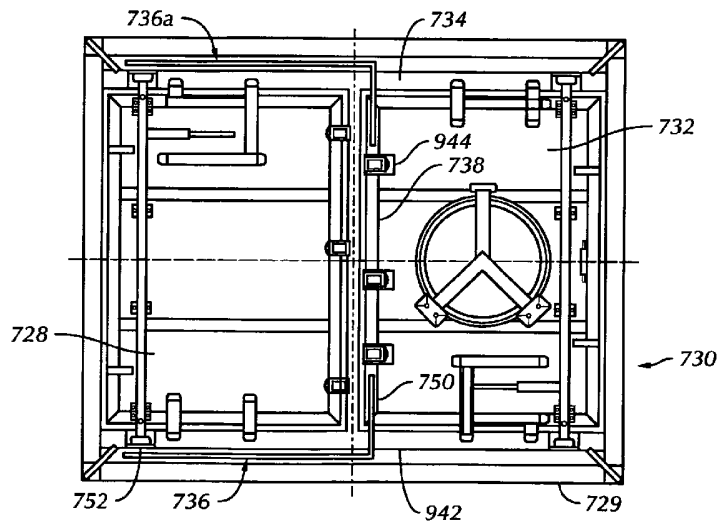


FIG. 9

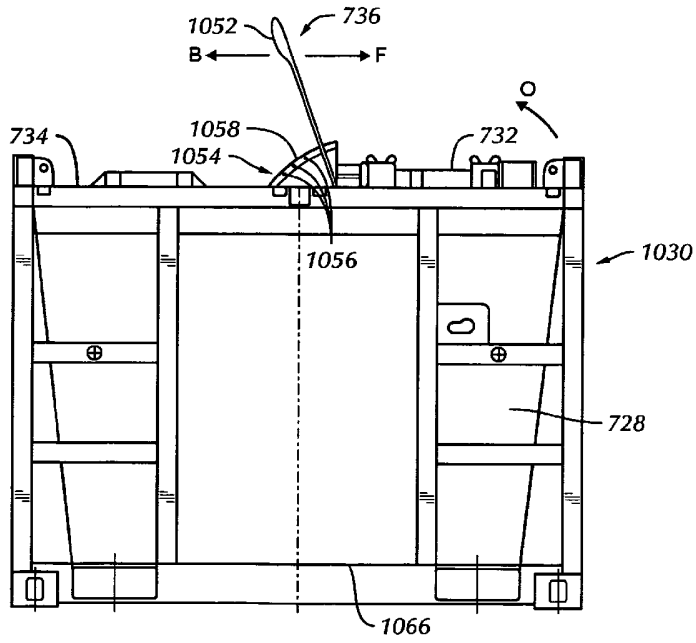


FIG. 10