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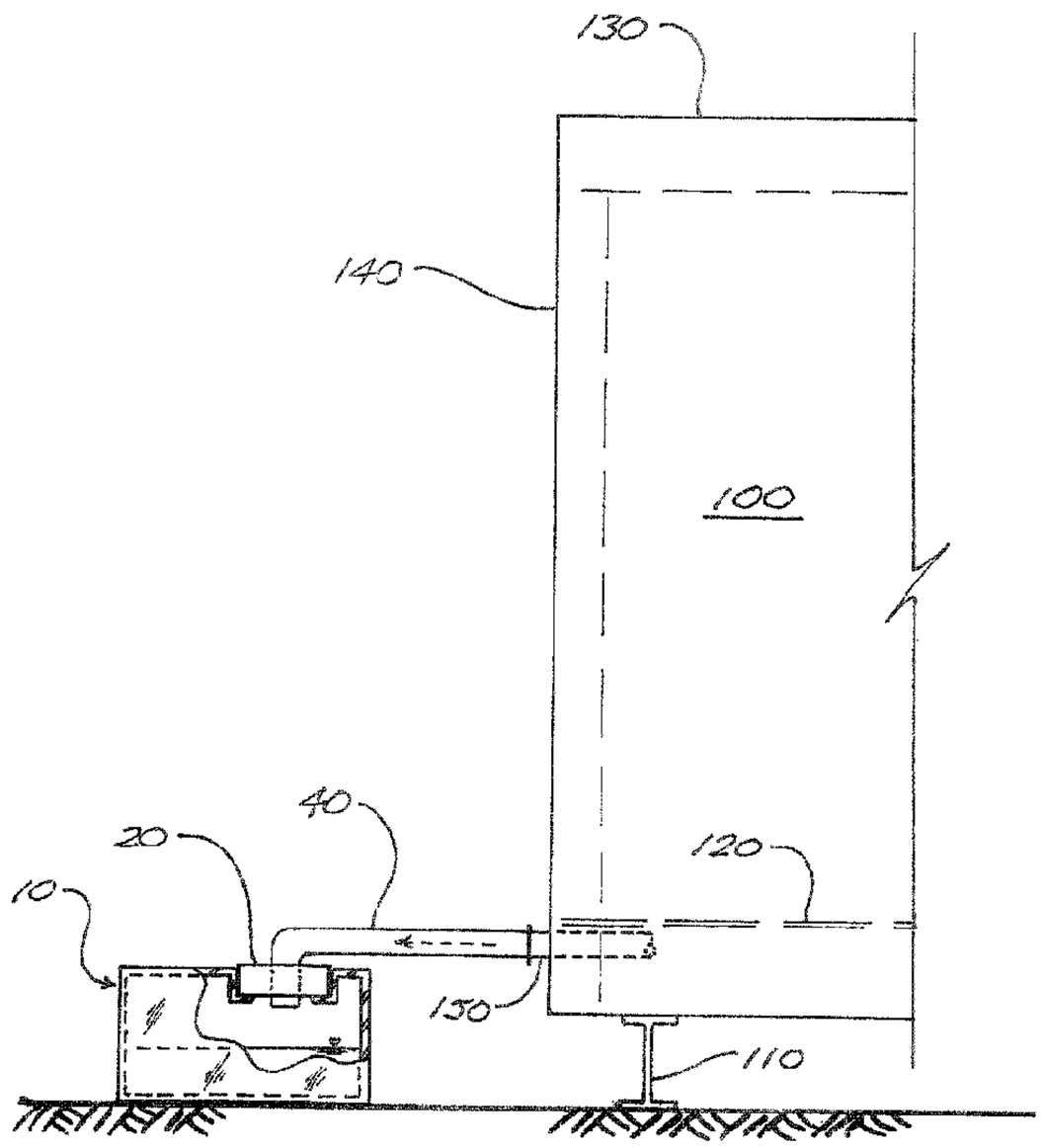


(57) Abrégé/Abstract:
A shallow, elongate, portable sewage containment vessel can be positioned at ground level adjacent to one or more relocatable buildings at wellsites and construction sites to receive domestic or industrial waste liquids from the buildings by gravity drainage. The roof member of the vessel has an elongate slot for snugly receiving an insert member made of a plastic or other readily drillable material. Holes may be drilled in the field at any convenient location in the insert member so that inlet piping from the sewage outlets of one or more buildings can be connected to the vessel. The vessel also has a connection for a vacuum truck or other equipment for removing the sewage from the vessel then the buildings are moved from the site, the containment vessels may be drained and then conveniently moved from the site, to be cleaned as appropriate and installed on a different site as desired. The insert members that were drilled to receive sewage piping may be discarded and replaced with new insert members for the vessels' next use.

ABSTRACT OF THE DISCLOSURE

A shallow, elongate, portable sewage containment vessel can be positioned at ground level adjacent to one or more relocatable buildings at wellsites and construction sites to receive domestic or industrial waste liquids from the buildings by gravity drainage. The roof member of the vessel has an elongate slot for snugly receiving an insert member made of a plastic or other readily drillable material. Holes may be drilled in the field at any convenient location in the insert member so that inlet piping from the sewage outlets of one or more buildings can be connected to the vessel. The vessel also has a connection for a vacuum truck or other equipment for removing the sewage from the vessel. When the buildings are moved from the site, the containment vessels may be drained and then conveniently moved from the site, to be cleaned as appropriate and installed on a different site as desired. The insert members that were drilled to receive sewage piping may be discarded and replaced with new insert members for the vessels' next use.

SEWAGE CONTAINMENT SYSTEM

FIELD OF THE INVENTION

The present invention relates to apparatus for temporary containment of liquid waste from relocatable buildings. More particularly, this invention relates to apparatus for receiving and temporarily containing sewage from skid-mounted temporary dwelling units on wellsites and construction sites.

BACKGROUND OF THE INVENTION

Industries such as oil and gas exploration and production, construction, and mining often require the use of temporary buildings at or near a work site to house workers, to serve as temporary offices, or to otherwise support the operations of the work site. It is particularly common to use relocatable buildings for purposes of a temporary camp facility, which may include dwelling units, mobile kitchens, wash facilities, and recreation facilities. Users of such relocatable buildings produce liquid sewage or wastes of various kinds that require some means of disposal. Perhaps the most common requirement is for disposal of human waste and/or wash water, but disposal of other types of waste, such as industrial waste or laboratory waste, may be required in some circumstances.

Relocatable buildings for wellsites and construction sites are often provided in the form of prefabricated mobile or skid-mounted units. Manufacturers of such skid-mounted units included Northgate Industries Ltd. of Edmonton, Alberta, Alta-Fab Structures Ltd. of Nisku, Alberta, and Shanco Camp Services Ltd. of Grand Prairie, Alberta. Skid-mounted wellsite units, for temporay housing of workers, are typically 12 feet (36.6 meters) wide, and from 40 to 60 feet (12.2 to 18.3 meters) in length. The units thus have two short end walls, plus long front and rear walls. Each unit has a pair of steel skids, typically 10 to 12 inches (254 to 305 mm) high, running the full length of the unit underneath the floor structure adjacent to the side walls. The floor structure is typically of conventional wood-framed construction; e.g., 2x10 wood joists with plywood sheathing. The skids rest on grade, so the floor surface inside the units will typically be only 20 to 22 inches (508 to 559 mm) above the adjacent ground surface.

Where dictated by their intended use, such as in dwelling units, kitchens, and wash facilities, the skid-mounted units will have a plumbing system connected to one or more sewage outlets (typically projecting through the rear walls of the units just below the floor sheathing), for drainage of sewage from the units to a sewage disposal system. However, construction sites and especially wellsites are often in remote locations where there is no sewage collection or treatment system. Therefore, alternative means must be provided to dispose of the sewage. The effectiveness of such disposal means is of particular importance in remote locations preservation of the natural environment and protection of ecological systems are of concern.

A simple type of sewage disposal system that has been used at wellsites and construction sites consists in piping the sewage from the temporary buildings to an open trench running away from the temporary site. This system's readily apparent health-related and environmental concerns make it clearly less than desirable if not completely unacceptable in some situations. A more common temporary sewage system involves piping the sewage from the relocatable buildings to a buried or partially buried central holding tank. The sewage in central holding tank can then be pumped onto a septic field (if environmentally acceptable) or transported (for example by a vacuum truck) to a sewage treatment facility. Some sites may have their own sewage treatment system on or near the site, but this will be viable in relatively few cases, due to cost considerations. consideration, on-site this is not practical and complexity, on-site treatment is less common.

Regardless of the ultimate disposal method, present systems for disposal of sewage from relocatable buildings can involve a considerable amount of planning, layout, design, excavation, and piping installation. Each relocatable building having a sewage outlet needs to be connected to a piping system leading to the drainage trench or holding tank as the case may be. The design, installation, maintenance, and ultimate removal of such systems can involve considerable expense, particularly because most if not all of the system components will typically be discarded after the system is decommissioned.

When the relocatable buildings are being used in freezing temperatures, such as during northern Canadian winters, the piping system also needs to be protected against

freezing of the liquid sewage and resultant piping damage and sewage spills. This can be accomplished by burying the piping, but in practice this is rarely done, because of cost. More commonly, the piping system laid on the ground surface, with protection against freezing being provided by heat-tracing and insulating the piping. In either case, however, a significant expense is incurred. Furthermore, where the sewage piping system is laid on grade, it can present an obstacle to vehicular and/or pedestrian traffic, which may entail the construction of stiles and ramps for crossing over the piping in some locations.

In view of the foregoing drawbacks with existing systems, there is a need for an improved sewage collection and disposal system that can be set up to service relocatable buildings on a wellsite, construction site, or other temporary facility without need for an extensive piping network or buried tanks. There is a further need for such systems that can be installed and then later removed with minimal disruption to the natural environment in the vicinity of the temporary facility. The present invention is directed to these needs.

BRIEF SUMMARY OF THE INVENTION

In general terms, the present invention is a sewage containment system that uses low-profile containment vessels that can be conveniently located at ground level adjacent to relocatable buildings. The containment vessels are of elongate configuration and comparatively shallow depth -- preferably about 16 to 18 inches (410 to 460 mm). These

conformational characteristics make it possible to maximize the vessels' storage capacity while being low to the ground to facilitate gravity drainage of sewage from the relocatable buildings. For example, a containment vessel nominally 18 inches (460 mm) high, 32 inches (815 mm) wide, and 24 feet (7.3 meters) long has a gross volume of approximately 96 cubic feet (2700 liters) or 600 Imperial gallons (720 U.S. gallons). This vessel would have a usable storage volume of at least 500 Imperial gallons (2270 liters, or 600 U.S. gallons).

A typical skid-mounted wellsite unit is equipped with hot and cold water storage tanks having a total capacity of 350 to 400 Imperial gallons. Therefore, a single sewage containment vessel as described above would have more than adequate capacity to receive the wellsite unit's full water storage capacity.

To facilitate connection to the sewage outlet of a relocatable building, the sewage containment vessel of the present invention is provided with one or more replaceable insert members that fit snugly into corresponding access openings in the roof member of the vessel. The insert members preferably will fit into the access openings in liquid-tight fashion, and even more preferably will make a vapour-tight seal. The insert members are made of a drillable material (preferably a plastic material), allowing holes to be drilled in the field at any convenient location in the insert member so that inlet piping from the sewage outlet of one or more buildings can be readily connected to the vessel without need for particularly precise pipe fabrication.

Accordingly, in one aspect the present invention is a portable sewage containment system, for receiving and temporarily retaining liquid sewage from a relocatable building having a sewage outlet, said sewage containment system comprising:

(a) an elongate containment vessel having a roof member and a base member, and having side walls interconnecting said upper and base members, said roof member having an access opening; and

(b) an insert member adapted to matingly engage said access opening;

wherein:

(c) the insert member is made of a drillable material;

(d) a plumbing port may be formed in the insert member at a selected location to receive a plumbed connection from the sewage outlet of the relocatable building; and

(e) the containment vessel further comprises drain connection means, to facilitate extraction of sewage from the containment vessel.

In the preferred embodiment, the containment vessel of the present invention has one or more longitudinal slots running substantially the full length of the vessel, for receiving elongate insert members which effectively permit connection of piping wherever desired along the length of the vessel. In other embodiments, the vessel may be adapted to receive a number of drillable insert members of square, rectangular, polygonal, curvilinear, or other shapes. This embodiment has the advantage that where only one or

two sewage pipes are connected to the vessel, when the vessel is later moved for use on a different site, only one or two small insert members will need to be replaced rather than a large insert member, thus reducing cost. However, by having a number of smaller insert members, the vessel retains its flexibility in terms of facilitating sewage pipe connections at any of numerous locations along the length of the vessel.

In the preferred embodiment, the sewage containment vessel also has a connection for a vacuum truck or other equipment for removing the sewage from the vessel. Preferably, the vessel will have one or more camlock fittings to ensure a vapour-tight seal to facilitate vacuum removal of sewage from the vessel. When the buildings are moved from the site, the containment vessels may be drained and then conveniently moved from the site, to be cleaned as appropriate and installed on a different site as desired. The insert members that were drilled to receive sewage piping may be discarded and replaced with new insert members for the vessels' next use.

In the preferred embodiment, the containment vessel of the present invention is fitted with fluid level alarm means, whereby facility operators may be given warning that the vessel needs to be emptied. Also in the preferred embodiment, the vessel has heating means, such as a submersible heater, for keeping stored sewage from freezing. The sewage piping from a building being served by the containment vessel may be protected from freezing by means of insulation and/or heat tracing of any well known type.

The containment vessel preferably features one or more lateral connections for interconnecting one or more additional vessels in fluid communication with each other. This arrangement can effectively increase the sewage storage capacity available for a given building, by effectively making available any excess capacity in an adjacent or nearby containment vessel serving another building. The provision of interconnection means also affords a convenient way to increase the storage capacity available to service a single building or group of closely-spaced buildings by using one or more interconnected vessels positioned side by side.

The containment vessel may also have one or more interior baffles to enhance the vessel's structural stiffness. Such baffles may be perforated in some fashion to permit sewage flow across the baffles, thus ensuring uniform distribution of sewage along the length of the vessel, and facilitating emptying of the vessel from a single vacuum connection at any selected location along the length of the vessel. The base member of the vessel may be constructed with a slope to facilitate flow of sewage toward the vacuum connection. The base member also may be fabricated with a well or depressed area to facilitate emptying by pumping or vacuum means.

In the preferred embodiment, the containment vessel will have two or more lifting lugs to facilitate transportation to and from sites where the vessel is used. In alternative embodiments, the vessel may be fitted with two or more wheels to further facilitate transportation of the vessel.

The containment vessel of the present invention may be made of any material that is suitable for liquid-tight fabrication and that is not prone to rapid degradation in response to extended contact with moisture and various kinds of sewage. For example, the vessel could be made of welded steel, either stainless steel or carbon steel that has been plated or coated to resist or inhibit corrosion. In the preferred embodiment, however, the vessel is made of a plastic material, such as polypropylene or high-density polyethylene, that has good corrosion resistance and can be readily formed into liquid-tight components using known fabrication techniques. The use of such synthetic materials has the added advantage of light weight compared to steel, which is advantageous when the containment vessel is being shipped by truck or other means of transportation.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described with reference to the accompanying figures, in which numerical references denote like parts, and in which:

FIGURE 1 is a perspective view of the preferred embodiment of a sewage containment vessel in accordance with the present invention.

FIGURE 2 is a cross-sectional view through the sewage containment vessel on line A-A in Figure 1.

FIGURE 2A is a partial cross-sectional view showing an alternative configuration of the access opening of the sewage containment vessel.

FIGURE 3 is a schematic elevation view of a sewage containment vessel in accordance with the present invention positioned adjacent to the rear wall of a skid-mounted wellsite unit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As illustrated in Figures 1 and 2, the present invention is an elongate sewage containment vessel **10** having a roof member **12** and a base member **14** interconnected by side walls **16** and end walls **18**. The roof member 12 has an access opening 19 adapted to receive an insert member **20** which through which a plumbing port **22** may be formed in a user-selected location, by drilling or other suitable means, to receive a plumbed connection **30** for connecting to a sewage outlet of a relocatable building.

In the preferred embodiment, the access opening 19 is an elongate slot running substantially the full length of the containment vessel **10**, as shown in Figure 1, with an insert member **20** or corresponding length. This arrangement allows for plumbing ports **22** to be placed a virtually any point along the length of the vessel **10**. As shown in particular detail in Figure 2, the access opening **19** may have L-shaped ledgers **15** along each longitudinal edge of the access opening **19**, for supporting the insert member. Depending on the dimensions selected for the ledgers **15**, the top surface of the insert

member **20** can be flush with the roof member **12** of the containment vessel **10**, or it could be slightly above or below the roof member **12**. In the alternative embodiment shown in Figure 2A, an upstanding curb **17** is provided adjacent to the edges of the access opening **19** for supporting the insert member **20**. Persons skilled in the art of the invention will appreciate that the means for supporting the insert member **10** in association with the access opening **19** other than as shown in Figures 2 and 2A may be devised and used without departing from the concept of the invention.

In an alternative embodiment (not illustrated), the containment vessel **10** may have a series of elongate access openings **19** extending substantially the full length of the roof member **12**, for receiving a corresponding number of correspondingly shorter insert members **20**. This alternative configuration has the advantage of providing the roof member **12** with greater structural strength and stiffness, as compared to the embodiment where the access opening **19** and the insert member **20** extend substantially the full length of the containment vessel **10**. A further potential benefit of this alternative configuration is that it provides for the possibility that one or more of the multiple elongate insert members **10** may not need to have a plumbing port **22** for a given installation, so such unperforated insert members **10** can continue to be used when the containment vessel **10** is re-used at a new location.

In other unillustrated embodiments, the roof member **12** may have a number of small access openings **19**, which could be of square, circular, polygonal, or other selected shape and would be adapted to receive insert members **10** of corresponding shape. These

alternative configurations would have benefits similar to those previously described in connection with the use of multiple elongate insert members **10**. The use of circular insert members **10** may be particularly advantageous in that it would be impossible for the insert members **10** to fall through their corresponding access openings **19**. The same advantage may also be available using insert members **10** of other shapes as well, depending on the relative dimensions of the insert members **10** and their corresponding access openings **19.**

The containment vessel **10** is fitted with drain connection means, whereby sewage may be extracted from the interior of the vessel **10** for disposal at a suitable facility. The drain connection means may comprise a pipe extending through the roof member of the vessel **10** to a selected point above the base member of the vessel **10**. In the preferred embodiment, the drain connection means will be a vacuum connection, as conceptually indicated by reference numeral **30** in Figure 2. The containment vessel **10** preferably will be fitted with a vent (not shown) to prevent or relieve undesirable accumulation of vapours inside the vessel **10**.

In the preferred embodiment, the containment vessel **10** will also have fluid level alarm means (not shown), which may be set to alert a user that sewage inside the vessel **10** has reached or is approaching a level necessitating that the vessel **10** be drained.

Also in the preferred embodiment, the containment vessel **10** will have at least one fitting for receiving a submersible electric heater, with a heating element that will be

at least partially immersed in any liquid sewage present inside the vessel **10** so as to prevent freezing of the sewage.

Figure 3 depicts a typical installation of a containment vessel **10** in association with a skid-mounted wellsite unit **100** or other relocatable building. Figure 3 conceptually depicts the floor structure **120**, roof structure **130**, and rear wall **140** of the wellsite unit **100**. The wellsite unit **100** is supported by longitudinal steel skids **110** which rest directly on grade (indicated by hatching). A containment vessel **10** in accordance with the present invention is positioned on grade adjacent to and substantially parallel to the rear wall **140** of the wellsite unit **100**. A plumbing port **22** is drilled or otherwise formed in the insert member **20** disposed in the access opening **19** of the containment vessel, and suitable piping **40** is connected at one end to the sewage outlet **150** of the wellsite unit and is fitted at the other end into the plumbing port **22** in the insert member **20** such that sewage will flow from the wellsite unit **100** into the containment vessel **10**.

It will be readily appreciate by those skilled in the art that various modifications of the present invention may be devised without departing from the essential concept of the invention, and all such modifications are intended to be included in the scope of the claims appended hereto.

In this patent document, the word "comprising" is used in its non-limiting sense to mean that items following that word are included, but items not specifically mentioned are not excluded. A reference to an element by the indefinite article "a" does not exclude

the possibility that more than one of the element is present, unless the context clearly requires that there be one and only one such element.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A portable sewage containment system, for receiving and temporarily retaining liquid sewage from a relocatable building having a sewage outlet, said sewage containment system comprising:

(a) an elongate containment vessel having a roof member and a base member, and having side walls interconnecting said roof and base members, said roof member having an access opening; and

(b) an insert member adapted to matingly engage said access opening;

wherein:

(c) the insert member is made of a drillable material, such that a plumbing port can be drilled through the insert member at a selected location to receive a plumbed connection from the sewage outlet of the relocatable building; and

(d) the containment vessel further comprises drain connection means, to facilitate extraction of sewage from the containment vessel.

2. The sewage containment system of Claim 1 wherein the insert member engages the access opening in substantially liquid-tight fashion.

3. The sewage containment system of Claim 1 wherein the access opening is an elongate access slot.

4. The sewage containment system of Claim 3 wherein the access slot extends substantially the full length of the containment vessel.

5. The sewage containment system of Claim 1 wherein the access opening is of curvilinear shape.

6. The sewage containment system of Claim 1 wherein the access opening is of polygonal shape.

7. The sewage containment system of Claim 1 wherein the drain connection means comprises an open pipe extending downward from the roof member of the containment vessel and terminating at a point above the base member of the vessel.

8. The sewage containment system of Claim 1 wherein the drain connection means comprises a vacuum fitting, to facilitate extraction of sewage from the containment vessel by vacuum means.

9. The sewage containment system of Claim 1, further comprising a camlock fitting associated with the drain connection.

10. The sewage containment system of Claim 1, further comprising fluid level alarm means.

11. The sewage containment system of Claim 1, further comprising heating means for heating sewage contained within the containment vessel.

12. The sewage containment system of Claim 11 wherein the heating means is a submersible heater.

13. The sewage containment system of Claim 1 wherein the containment vessel further comprises one or more internal baffles.

14. The sewage containment system of Claim 13 wherein the one or more internal baffles have perforations.

15. The sewage containment system of Claim 1 wherein a portion of the base member of the containment vessel slopes toward the drain connection.

16. The sewage containment system of Claim 1 wherein the base member of the containment vessel defines a well section associated with the drain connection.

17. The sewage containment system of Claim 1 wherein containment vessel further comprises a plurality of lifting lugs.

18. The sewage containment system of Claim 1 wherein the material from which the containment vessel is fabricated comprises a corrosion-resistant material.

19. The sewage containment system of Claim 18 wherein the corrosion-resistant material comprises stainless steel.

20. The sewage containment system of Claim 18 wherein the corrosion-resistant material comprises a plastic.

21. The sewage containment system of Claim 20 wherein the plastic is selected from the group consisting of polypropylene and high-density polyethylene.

22. The sewage containment system of Claim 1 wherein the drillable material from which the insert member is fabricated comprises a plastic.

23. The sewage containment system of Claim 1, further comprising a vent associated with the containment vessel, said vent being adapted to vent vapours from within the containment vessel.

24. The sewage containment system of Claim 1 wherein the containment vessel further comprises a plurality of wheels to facilitate transportation of the vessel.

25. The sewage containment system of Claim 1 wherein the height of the containment vessel walls is selected such that when the containment vessel is positioned on grade adjacent to the relocatable building, sewage can flow by gravity from the sewage outlet of the building into the containment vessel.

26. The sewage containment system of Claim 1, further comprising pump means for pumping sewage from the relocatable building into the containment vessel.

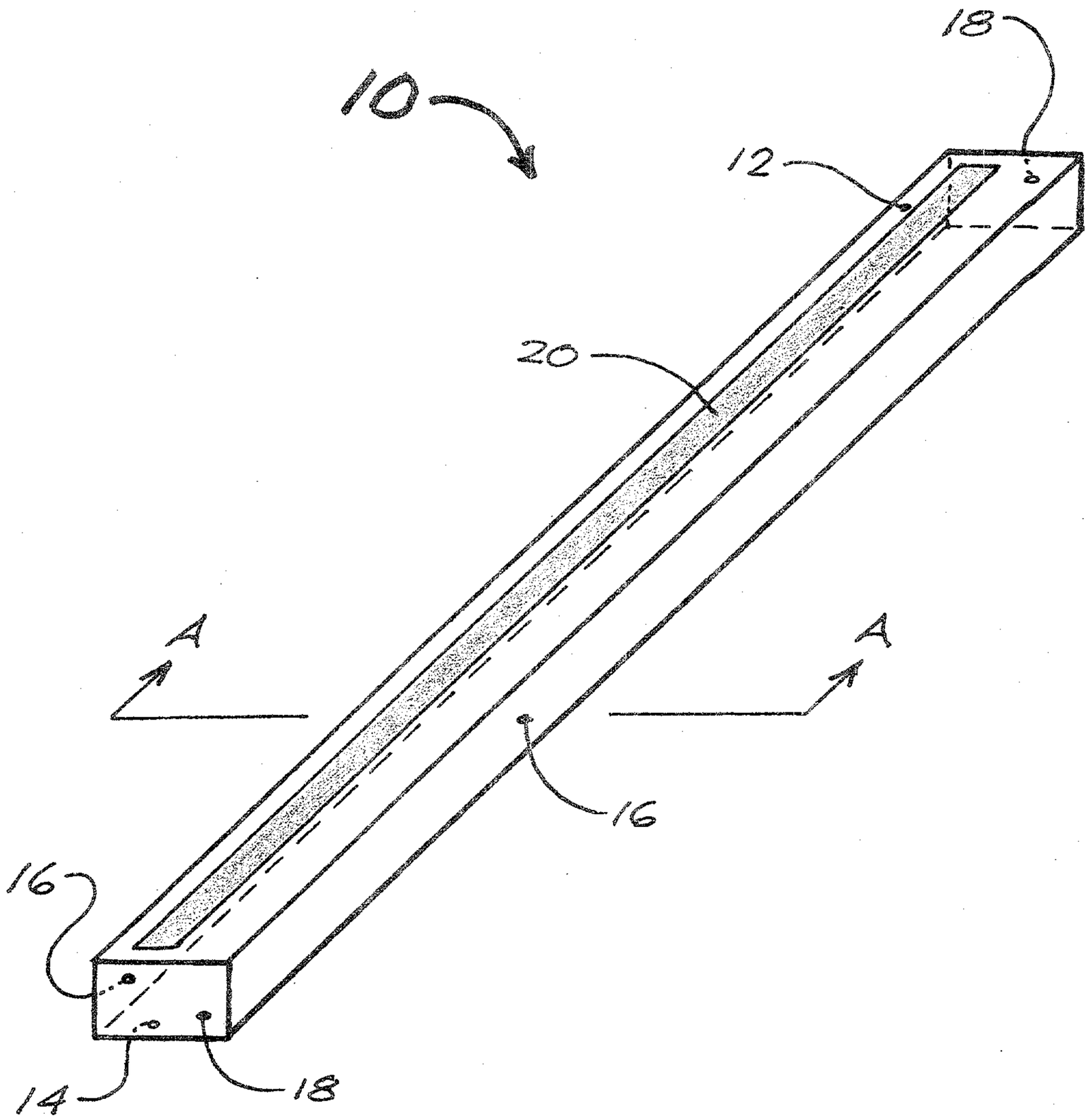


FIG. 1

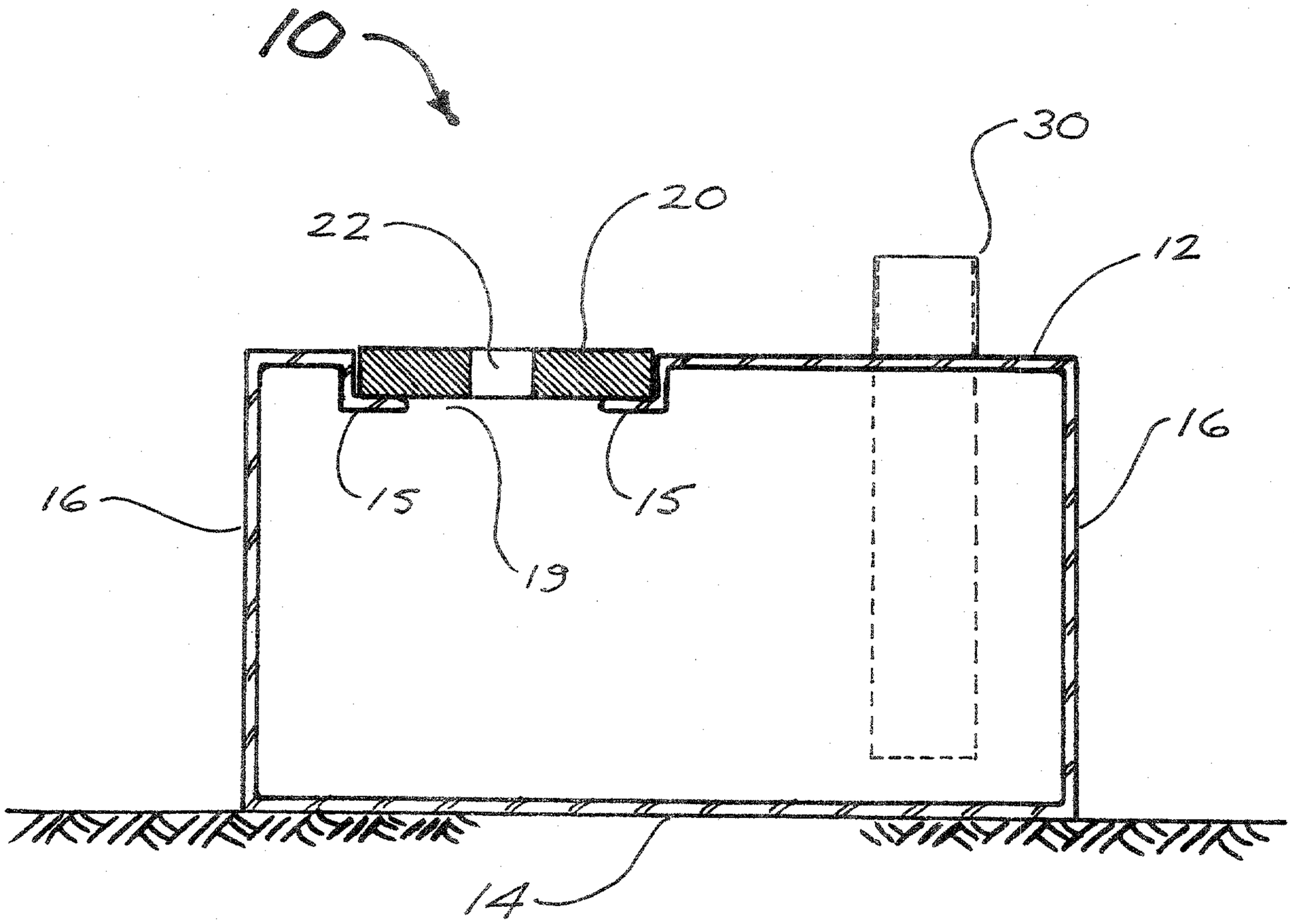


FIG. 2

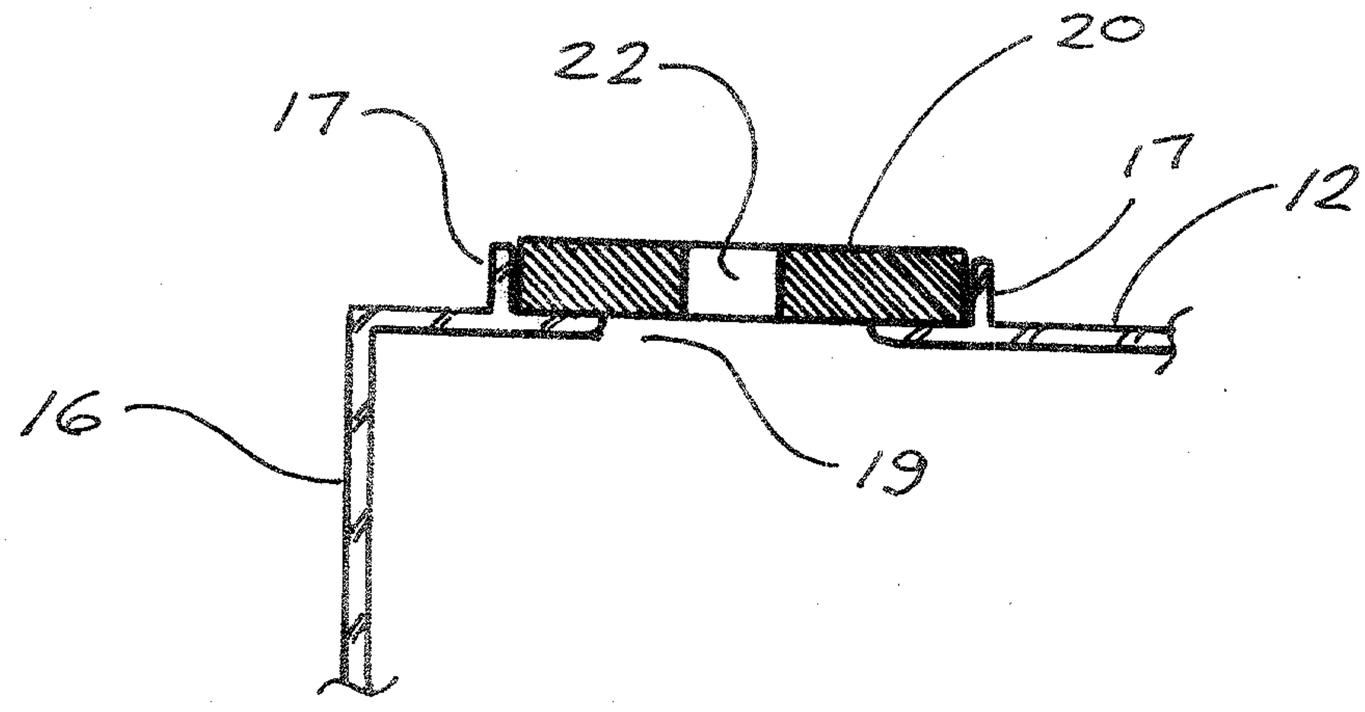


FIG. 2A

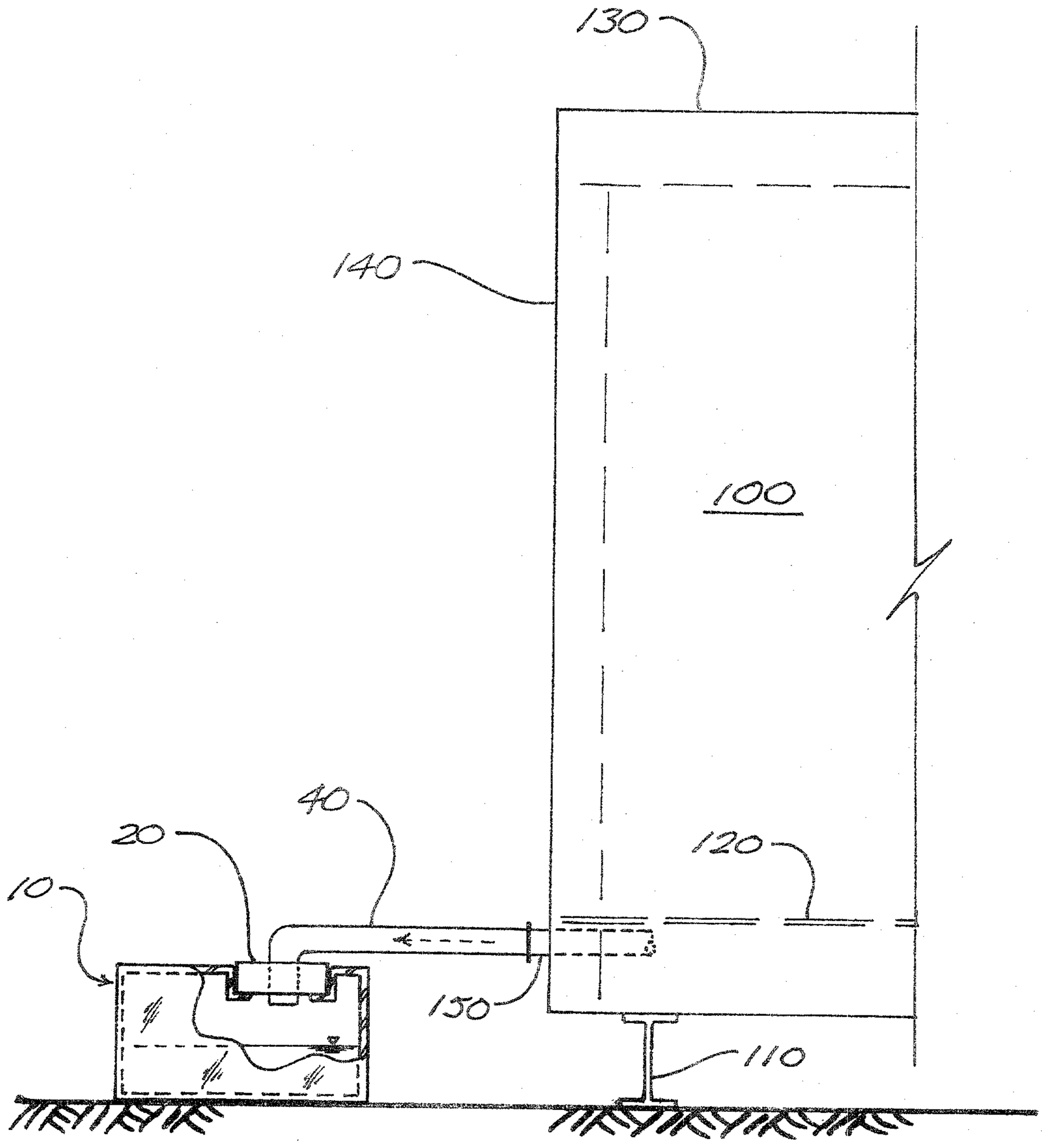
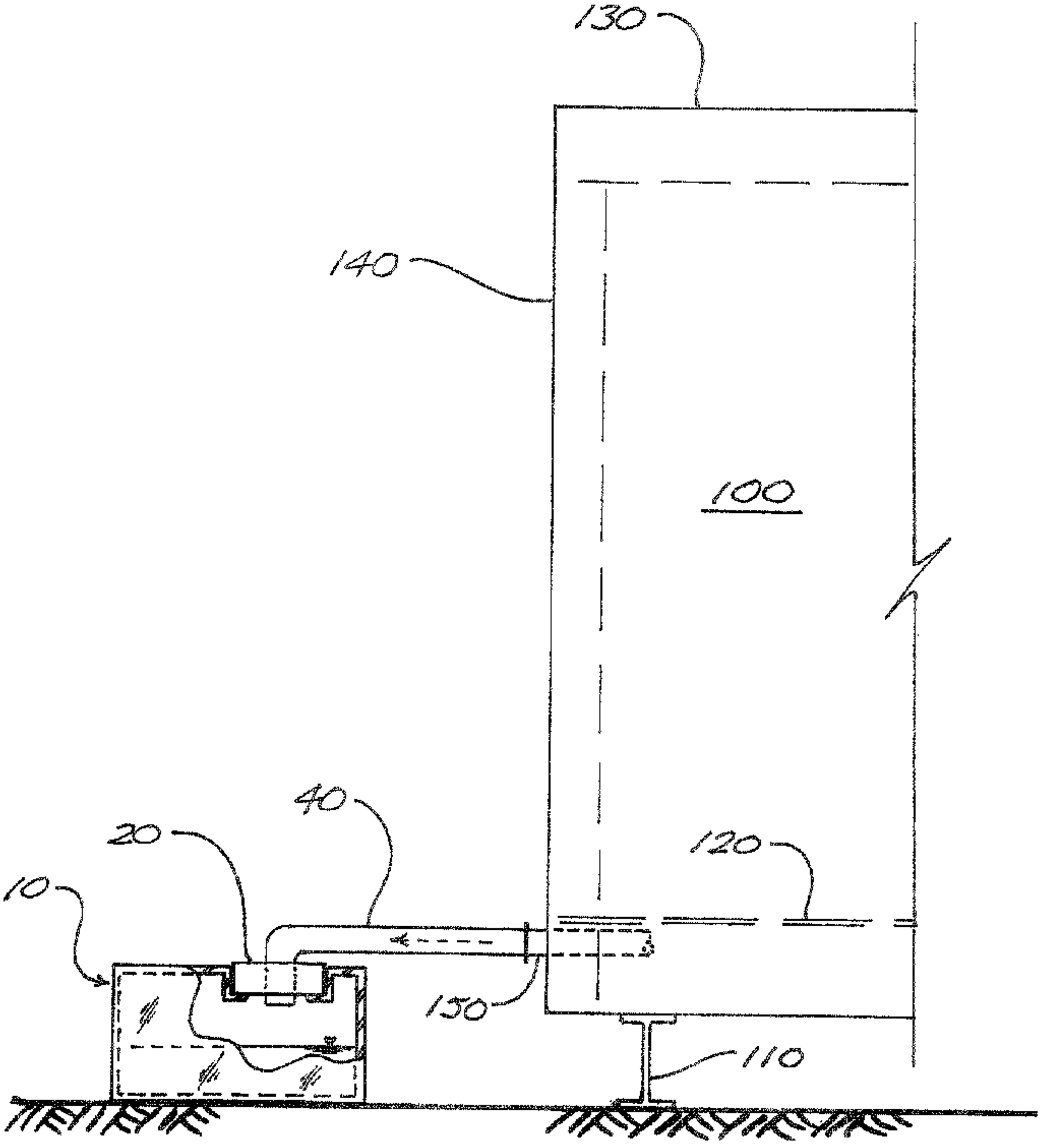


FIG. 3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