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(54) Titre : CUVES THERMALES COMPARTIMENTEES
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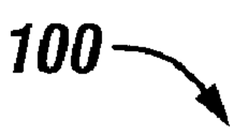

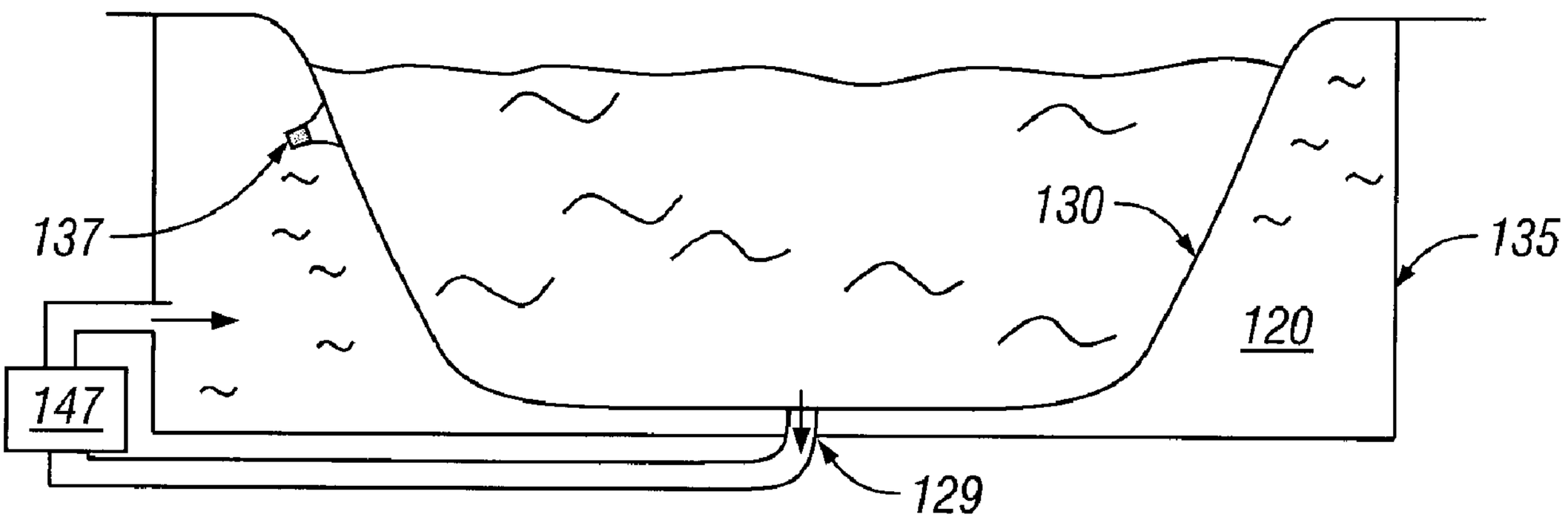

(57) Abrégé/Abstract:
A spa system with multiple vessels to handle water leakage while preventing damage to the spa system. In one implementation, a spa system includes a first vessel configured to hold water and one or more persons, and a second vessel attached to the first vessel. The second vessel has a pressurized cavity for water. The system includes a water jet connected between the first and second vessels, in which the water jet is configured to use water pressure in the pressurized cavity to send water from the second vessel into the first vessel. The system also has a watertight seal around a water jet connection, in which the water jet is positioned to allow water leakage between the first and second vessels upon a watertight seal failure. In some implementations, the first and second vessels are twin-sheet bonded and embedded channels are used for air and water circulation.

ABSTRACT

A spa system with multiple vessels to handle water leakage while preventing damage to the spa system. In one implementation, a spa system includes a first vessel configured to hold water and one or more persons, and a second vessel attached to the first vessel. The second vessel has a pressurized cavity for water. The system includes a water jet connected between the first and second vessels, in which the water jet is configured to use water pressure in the pressurized cavity to send water from the second vessel into the first vessel. The system also has a watertight seal around a water jet connection, in which the water jet is positioned to allow water leakage between the first and second vessels upon a watertight seal failure. In some implementations, the first and second vessels are twin-sheet bonded and embedded channels are used for air and water circulation.

Multi-Vessel Spas

TECHNICAL FIELD

This invention relates to spas, and more particularly to multi-vessel spa systems.

BACKGROUND

Spa or hot tub implementations typically have a single shell to hold water and one or more people. The spa shell is typically molded into a tub-like form, and may include one or more molded seats for occupants. The spa shell can be constructed from one or more materials (e.g., plastic, fiberglass, composites) that can withstand both the pressure and temperature of the water, as well as the weight of the water and any occupants.

The water in the spa can be recirculated by pumping or draining water out of the spa (e.g., usually at the bottom of the spa) and injecting water into the spa using one or more water jets. When the water is pumped out of the spa, the water can be filtered to remove debris and heated to a comfortable level for persons in the spa. The spa shell has hull penetrations (e.g., holes or openings) at locations where the jets interface with the shell and where the water is pumped out of the spa. These hull penetrations typically are sealed watertight (e.g., via adhesives, welds, fasteners, and the like) around the openings to prevent leaks. Inner cavities below the shell of the spa can be filled with foam, fiberglass and/or other supportive materials to stabilize and reinforce the shell structure.

SUMMARY

The present disclosure offers one or more advantages over conventional spas. In one general aspect, a system for a spa includes a first vessel configured to hold water and one or more persons, and a second vessel attached to the first vessel. The second vessel has a pressurized cavity for water. The system includes a water jet connected between the first and second vessels. The water jet is configured to use water pressure in the pressurized cavity to send water from the second vessel into the first vessel. The system also has a watertight seal around a water jet connection, in which the water jet is positioned to allow water leakage between the first and second vessels upon a watertight seal failure.

Advantageous implementations can include one or more of the following. The system can include a water pump to pressurize the pressurized cavity. The second vessel can hold the entirety of a bottom of a shell of the first vessel and sidewalls of the shell of the first vessel. The system can allow water leakage between the first and second vessels in a location around the water jet connection if the watertight seal fails. Also, there can be many openings in the shell of the first vessel, in which the first and second vessels can be connected to a circulation system that includes tubes, pipes, and connectors. The circulation system may also include water jets in at least one opening in a shell of the first vessel.

The system can have a water jet nozzle that adjusts a force of water sent into the first vessel by adjusting a water jet nozzle aperture. The water jet may have a nozzle responsive to an adjustment in water pressure. The system may include a manual adjustment apparatus to facilitate manual adjustment of water pressure of the second vessel, and an electronic adjustment apparatus to adjust water pressure of the second vessel. There can be a twin-sheet bond used for the attachment between the first and second vessels.

The system may also have a number of other vessels attached to the first vessel, in which each of the other vessels have a pressurized cavity for water. There may be one or more water jets connected between the first vessel and the other vessels, in which the water jets use water pressure in each of the pressurized cavities of the other vessels to send water from those vessels into the first vessel. The system can also have a watertight seal around each of one or more water jet connections, in which each water jet is positioned to allow water leakage between the first vessel and the other vessels upon a watertight seal failure.

In another general aspect, a spa system includes a first vessel configured to hold water and a second vessel configured to substantially hold the first vessel. The second vessel is also configured to hold pressurized water. The system includes a circulation system with at least one water jet. The water jet is positioned between the first and second vessels and is configured to use water pressure in the second vessel to send water into the first vessel. The system also has a watertight seal around a connection of the water jet. The first and second vessels are positioned to receive leaking water upon a malfunctioning of the watertight seal.

Advantageous implementations can include one or more of the following. In substantially holding the first vessel of the spa system, the first vessel can be substantially located inside the second vessel. The system may include an adjustment apparatus to adjust water pressure of the second vessel, and an air injecting apparatus to increase water pressure in the second vessel. The water jet can have an aperture to adjust a force of water sent into

the first vessel, in which the aperture can be responsive to a water pressure adjustment apparatus. A water pump can be used to pressurize the water in the second vessel.

In another general aspect, described is a method to prevent damage in a spa upon a failure of a watertight seal. The method involves attaching a water pump to the spa and attaching a first vessel with a second vessel. The first vessel is configured to hold water for the spa, and the second vessel is configured to hold water in a pressurized cavity. The water pump is configured to pressurize water in the cavity of the second vessel. The method includes connecting a water jet between the first and second vessels, in which the connecting involves attaching the watertight seal at a water jet connection. The method also involves using water pressure in the pressurized cavity to send water from the second vessel into the first vessel with the water jet. The watertight seal is configured such that water leaks between the first and second vessels if the watertight seal fails.

Advantageous implementations can include one or more of the following. There can be a number of plumbing openings formed in the first vessel. The method may involve attaching the first and second vessels by sonically welding the first and second vessels, welding the first and second vessels with a solvent, and/or mechanically fastening the first and second vessels. The formation of the first and second vessels can involve a plastic material, in which the a plastic strengthening agent can be used to reinforce the first and second vessels. The attachment of the first vessel with the second vessel may involve a twin-sheet bonding process, in which the twin-sheet bonding process can include bonding the first vessel with the second vessel, and providing one or more openings between first and second vessels for air and water circulation.

In another general aspect, described is a system for a spa with a first vessel to hold water and one or more persons, and a second vessel attached to the first vessel. The attachment includes a twin-sheet bond between the first vessel with the second vessel. Embedded channels are located between the first and second vessels for air and water circulation in the spa.

Advantageous implementations can include one or more of the following. A contour of an outer vessel wall at an area of the embedded channels can protrude or extend outward from a sitting area of the spa. The embedded channels can be effectively "shrink-wrapped" between the first and second vessels.

The techniques described in this specification can be implemented to realize one or more of the following advantages. In one instance, the multi-vessel system can reduce the opportunity for leaks in the spa. In the event that leaks do occur, the spa system can reduce

the need for replacement and repair of the spa. The spa system may be made (e.g., manufactured, constructed, produced) cheaper than traditional spa systems. For example, the materials for the spa seals may be made with a less expensive material and/or the seals may be formed under reduced manufacturing steps or less stringent manufacturing specifications. A number of joints and parts for the plumbing may also be reduced from traditional spa systems. The spa system may be more reliable to the end-user, and the hydraulic performance of the multi-vessel system can be similar to or better than traditional spa systems.

The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features, objects, and advantages will be apparent from the description and drawings, and from the claims.

DRAWING DESCRIPTIONS

FIGS. 1A-1C are exemplary diagrams of the vessel in a vessel system.

FIG. 2A is an exemplary diagram of a multi-vessel system.

FIG. 2B is an exemplary diagram of the second vessel shown in FIG. 2A.

FIG. 2C is an exemplary diagram of the system shown in FIG. 2A.

FIGS. 3A-3C show exemplary diagrams of a spa with embedded channels for air and/or water circulation.

Like reference symbols in the various drawings may indicate like elements.

DETAILED DESCRIPTION

The following description includes systems, methods, and techniques related to multi-vessel systems for fluid systems, such as pools, tubs, and spas.

As used here, the term "vessel" may refer to an object that is capable of containing liquids (e.g., water). The multi-vessel system within this disclosure describes a system for a spa that can reduce the possibility for leaks. The vessel may be shaped in the form of a tub and may have one or more seats for one or more persons. The vessel has holes or openings that are used for filling the vessel with water and recirculating water in the vessel. These holes or openings typically are connected to water jets and/or plumbing pipes, and are sealed watertight to prevent leaks from around the openings. However, these openings can be susceptible to leaks despite the watertight seals. In traditional spa systems, water from these leaks can damage the interior sections of the spa (e.g., insulation, foam, electrical) and the structural support of the spa (e.g., patio decks, beams, floors). The water leaks may also be

difficult to detect and repair, and damage from the leaks could result in a costly expense for the owner of the spa.

This disclosure describes a spa system with an inner vessel and an underlying outer vessel. The primary vessel (e.g., inner or first vessel) has a shell container that can serve as a traditional spa shell to hold water for the spa and one or more occupants. The primary vessel shell can be a type of shell that is similar to one that may be used in traditional spa systems in shape and form. The secondary vessel (e.g., outer vessel) can be positioned underneath or behind the openings of the primary vessel (e.g., away from the tub side), so if a leak develops around an opening, the leaking water may flow between the secondary and primary vessels, and no damage will result in the structure or function of the spa system.

The shell of the secondary vessel can be made of a material (e.g., plastic) that can withstand a pressurized chamber. In addition to the water in the primary vessel, the secondary vessel can contain the water for the hydraulic system. The secondary vessel can have one or more water jets. The secondary vessel can be pressurized with a water pump. The pressurization of the secondary vessel cavity can drive the water jets. The water flow from the nozzle of the water jets can be controlled by adjusting the cavity pressure. In another implementation, the water flow from the nozzle of the water jets can be controlled by adjusting the aperture opening of the nozzle. The control of the flow of water from the nozzle of the water jets may be controlled manually or electronically. In another implementation, air can be integrated into the jets to increase the pressure of the water forced out of the jets. Alternatively, a high-pressure pump can be used to create a high pressure in the secondary vessel cavity to increase the pressure of the water forced out of the jets. The spa system may appear and perform the same as a traditional spa system from the viewpoint of a spa user. The multi-vessel spa system can offer improved reliability and lower maintenance costs over traditional spa systems.

In one aspect, the multi-vessel spa system may have a number of possible implementations to reduce the opportunity for leaks, and/or reduce or eliminate potential damage caused by the leaking water if leaks occur. At least two types of system configurations are shown below. In a first system configuration (e.g., a vessel in a vessel spa system), a substantial portion of a primary vessel (e.g., sidewalls and underneath) is surrounded by the secondary vessel. In a second system configuration (e.g., a multi-vessel spa system), a secondary vessel is placed behind or underneath each opening, or group of openings, in the primary vessel, in which the spa system can include multiple secondary vessels.

Fig. 1A shows an exemplary diagram of the spa system 100 in which a primary (first) vessel is surrounded by a secondary vessel. The spa system 100 has an inner shell 130 that holds water and one or more occupants. Behind and/or underneath the inner spa shell 130, the outer spa shell 135 can hold water in a water cavity 120. The water cavity 120 of the secondary vessel may be pressurized. The secondary vessel can have one or more water jets 137. The secondary vessel can be pressurized with a water pump 147. The pressurization of the secondary vessel cavity can drive the water jets 137. The water flow from the nozzle of the water jets can be controlled by adjusting the cavity pressure and/or the aperture of the nozzle.

In Fig. 1A, the secondary vessel can hold the entire area behind (e.g., sidewalls) and underneath (e.g., bottom area) the primary vessel. In another aspect, the secondary vessel may be able to hold the primary vessel and the contents of the primary vessel. The primary vessel can be placed inside the secondary vessel. The secondary vessel may also add some structural support to the primary vessel.

In the fluid system shown in Fig. 1A, one or more pumps may be used to circulate the water. In circulating the water, the water may be sucked from a section of the spa through an opening 129 and sent through a pump 147 to another destination in the secondary vessel (Fig. 1A). Typically, the water can be filtered to remove particles and debris during circulation. The filtration system may also reduce bacteria by, for example, introducing ozone in the filtered water. The circulation system may also have a heater (not shown) to warm the water to a certain temperature (e.g., above 90°F). The circulation system may also have one or more water jets 137 to inject the filtered water back into the primary vessel of the spa. The one or more water jets 137 can be positioned inside of the secondary vessel, and connected to the pump with one or more pipes or tubes.

The openings in the shell of the primary vessel include openings for the plumbing, water jets 137, and the drain 129 in the primary vessel. Depending on the particular implementation, the drain 129 section may be in the primary vessel and/or the secondary vessel, and may drain water by gravity instead of, or in addition to, the hydraulic forces of the one or more pumps.

The shell 130 for the primary vessel may be constructed as a plastic thermoformed shell. The formation of the openings in the shell 130 and the installation of the jets 137 may be constructed with less emphasis on forming watertight seals than in traditional spa implementations. The jet seals may aid in stabilizing the pressure inside of the secondary

vessel. The water around the jet seals may leak between the primary vessel and the secondary vessel and may not damage the spa system.

The secondary vessel may also be formed of a plastic material, and may hold a specified amount of water. The secondary vessel may be constructed from a large piece of material that encloses all of the jets 137 of the spa system, and may have openings for pump lines or plumbing. The secondary vessel may be sonically welded to the inner spa shell 130. Alternatively, the welding may be done by a solvent or the shells 130, 135 may be mechanically fastened together. The inner and outer shells 130, 135, may also be connected in a twin sheet bonding process, in which the outer shell 135 holds the inner shell 130.

The spa system 100 may use a suctioning system that may utilize one or more valves (e.g., check valves) to ensure that the fittings in the system 100 pull or suction water instead of pushing water. The air for the jets may be conducted through manifolds and airlines (not shown) that run through the secondary vessel to the jets 137. The checks (e.g., pop checks) for the air system can be on the outside of the secondary vessel and located by the pump 147 to draw in warm air using a venturi system (e.g., a system for speeding the flow of fluid by using a cone-shaped tube). In addition to the inner shell 130 being supported by the outer shell 135, the inner/primary shell 130 may be reinforced with a plastic strengthening agent.

Fig. 1B shows the spa system of Fig. 1A with an additional layer 139 of support to the outer spa shell 135. The outer spa shell support 139 may also include a thermal insulating material, fiberglass, and/or a supportive foam material. Fig. 1C shows another diagram of an exemplary vessel in a vessel spa system. In Fig. 1C, the shell of the primary vessel is contoured to form multiple seating areas in the spa.

In some implementations, the bottom portion of the primary vessel may have structural supports (not shown) to help support the weight of the primary vessel (e.g., weight of the primary vessel, water, and/or any occupants). The structural support may include one or more beams between the shell of the primary vessel and the outer spa shell. In a typical case, the support beams may not impede normal water circulation in the secondary vessel.

Fig. 2A shows a second system configuration of the multi-vessel spa system. In the second configuration, the spa is divided into hydraulic sections, in which there may be a one or more pressurized secondary vessels. The second configuration (Figs. 2A-2C) can differ from the first configuration (Figs. 1A-1C) in that the second configuration may have multiple pressurized secondary vessel cavities rather than a single cavity that holds the entire lower portion and sidewalls of the primary vessel. In the second configuration, each jet (or group of jets) may have a designated secondary vessel, in which each secondary vessel can be attached

to the primary vessel and may eliminate any damage that could result from leaks around the seals. The jets may be situated around one or more seats, as shown in Fig. 2A. In the event that a leak does occur in the any of the openings in the primary shell, the water in the primary shell can leak into the secondary vessel, and no overall damage to the spa system may occur as a result of the leak.

The primary vessel may be formed with a plastic thermoformed shell, as described in Fig. 1A. Openings for the jets can be drilled, and jets can be installed to inject water into the primary shell. Air can go into manifolds and then routed to one or more secondary vessels to be used by the jets. Fig. 2A shows a secondary vessel 235 with openings on the outside of the secondary vessel for suction 210 and pressure 215, as well as an air manifold 220. The secondary vessel also shows a sealing flap 225 that can be used to help attach the secondary vessel 235 to the primary spa shell 230.

Fig. 2B shows a cross-sectional profile of the secondary vessel 235. The jets 237 in the secondary vessel cavity inject water into the primary vessel 239. As discussed in relation to the jets of the first spa configuration above, the secondary vessels can allow the spa system implementation to have a reduced emphasis on ensuring watertight seals around the jets. The reduced emphasis may result in lower installation expenses for the jets 237. These secondary vessels may be connected to the primary vessel by one or more means, such as sonic welding, solvent welding, or mechanical fastening. The secondary vessels may also have shell material that is reinforced and/or may have external reinforcements to the backside (e.g., a direction away from the primary vessel) of the shell. The reinforcements to the multiple secondary shells may, in effect, also reinforce the primary shell structure as well.

In another implementation, the first exemplary system configuration, shown in Figs. 1A-1C, and/or the second exemplary configuration, shown in Figs. 2A-2C, may be formed with the twin-sheet bonding process. In the twin-sheet bonding process, the outer shell, which encases the plumbing, is bonded to the inner shell, which holds the water. In the bonding process, the only openings left between the two shells can be used to for air and water circulation, for example, to pressurize the plumbing area of the outer shell. After the twin-sheet bonding process, the spa will have an appearance such that the outer shell will look like it has been "shrink-wrapped" on to the inner shell.

FIGS. 3A-3C show exemplary diagrams of a spa 300 with embedded channels 310 for air and/or water. The area between the inner shell 320 and the outer shell 330 has channels 310 to allow water and/or air to flow in those channels 310. The channels 310 may be used for plumbing and aeration in distributing water and/or air throughout the spa 300. As shown

in Fig. 3A, the channels 310 can wrap around the spa 300. Fig. 3A also illustrates that the channels 310 are attached to individual water jets, in which a channel pattern 305 is formed in the outer shell 330 and each channel is connected to a water jet. The exemplary channel pattern 305 shown in Fig. 3A is configured for six water jets.

In some exemplary implementations, the spa 300 can be formed with a twin-sheet bonding process such that the channels 310 may extend or protrude outwards from the outer shell 310, as shown in Figs. 3B-3C. As shown in Figs. 3B-3C, the contour of the wall of the inner shell 320 can remain flat and smooth, and the outer shell 330 can have outward facing bumps at the channel areas. The channels 310 are embedded between the inner shell 320 and the outer shell 300, and have an appearance such the channels 310 can look like they have been effectively "shrink-wrapped" between the shells of the spa 300.

A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, although Fig. 2A shows a single secondary vessel 235 on one side of the spa, the second vessel may be large enough to cover two or three sides of the spa, including a bottom portion of the spa. Hence, there may be an implementation where there are two large secondary vessels, with each vessel covering approximately one half the primary vessel. In the examples above, the overall labor and costs involved in the implementation, construction, cleaning, and maintenance of the plumbing system of the spa can be lower than those systems of traditional spas. Furthermore, the manufacturing costs of the spa design may be reduced, while providing similar hydraulic performance. In some cases, the hydraulic performance of the multi-vessel spa implementations may exceed the hydraulic performance of traditional spa implementations. The channels 310 shown in Figs. 3A-3B can have varying dimensions thought the spa to account for various amounts of water and/or air flow and pressure. For example, the dimensions of the embedded channels at the bottom of the spa may be larger than the dimensions of the channels along the sidewalls of the spa. In another example, the dimensions of the embedded channels used for draining water out of the spa may be larger than the dimensions of the channels used to send water into the spa. Accordingly, other embodiments are within the scope of the following claims.

WHAT IS CLAIMED IS:

1. A system for a spa comprising:

a first vessel configured to hold water and one or more persons;

a second vessel attached to the first vessel, wherein the second vessel comprises a pressurized cavity for water;

a water jet connected between the first and second vessels, wherein the water jet is configured to use water pressure in the pressurized cavity to send water from the second vessel into the first vessel; and

a watertight seal around a water jet connection, wherein the water jet can allow water leakage between the first and second vessels.

2. The system in accordance with claim 1, further comprising a water pump to pressurize the pressurized cavity.

3. The system in accordance with claim 2, wherein the second vessel is configured to hold the entirety of a bottom of a shell of the first vessel and sidewalls of the shell of the first vessel.

4. The system in accordance with claim 3, wherein the system is configured to allow water leakage between the first and second vessels in a location around the water jet connection if the watertight seal fails.

5. The system in accordance with claim 3, wherein a plurality of openings are in the shell of the first vessel.

6. The system in accordance with claim 2, wherein the first and second vessels are connected to a circulation system comprising tubes, pipes, and connectors.

7. The system in accordance with claim 6, wherein the circulation system further comprises a plurality of water jets in at least one opening in a shell of the first vessel.

8. The system in accordance with claim 1, further comprising a water jet nozzle that adjusts a force of water sent into the first vessel by adjusting a water jet nozzle aperture.

9. The system in accordance with claim 1, further comprising a manual adjustment apparatus to facilitate manual adjustment of water pressure of the second vessel.

10. The system in accordance with claim 1, further comprising an electronic adjustment apparatus to adjust water pressure of the second vessel.

11. The system in accordance with claim 1, wherein the water jet comprises a nozzle responsive to an adjustment in water pressure.

12. The system in accordance with claim 1, wherein the attachment between the first and second vessels comprises a twin-sheet bond.

13. The system in accordance with claim 1, further comprising:

a plurality of vessels attached to the first vessel, wherein each of the plurality of vessels comprises a pressurized cavity for water;

one or more water jets connected between the first vessel and the plurality of vessels, wherein the one or more water jets are configured to use water pressure in each of the pressurized cavities of the plurality of vessels to send water from the plurality of vessels into the first vessel; and

a watertight seal around each of one or more water jet connections, wherein each water jet is positioned to allow water leakage between the first and the plurality of vessels upon a watertight seal failure.

14. A spa system comprising:

a first vessel configured to hold water;

a second vessel configured to substantially hold the first vessel, the second vessel further being configured to hold pressurized water;

a circulation system comprising at least one water jet, wherein the water jet is positioned between the first and second vessels and is configured to use water pressure in the second vessel to send water into the first vessel; and

a watertight seal around a connection of the water jet, wherein the first and second vessels are positioned to receive leaking water upon a malfunctioning of the watertight seal.

15. The spa system in accordance with claim 14, wherein substantially holding the first vessel comprises the first vessel being substantially located inside the second vessel.

16. The spa system in accordance with claim 15, further comprising an adjustment apparatus to adjust water pressure of the second vessel.

17. The spa system in accordance with claim 15, further comprising an air injecting apparatus to increase water pressure in the second vessel.

18. The spa system in accordance with claim 14, wherein the water jet comprises an aperture operable to adjust a force of water sent into the first vessel.

19. The spa system in accordance with claim 18, wherein the aperture is configured to be responsive to a water pressure adjustment apparatus.

20. The spa system in accordance with claim 14, further comprising a water pump to pressurize the water in the second vessel.

21. A method to prevent damage in a spa upon a failure of a watertight seal, the method comprising:

attaching a water pump to the spa;

attaching a first vessel with a second vessel, wherein the first vessel is configured to hold water for the spa, and wherein the second vessel is configured to hold water in a pressurized cavity, wherein the water pump is configured to pressurize water in the cavity of the second vessel;

connecting a water jet between the first and second vessels, wherein the connecting comprises attaching the watertight seal at a water jet connection; and

using water pressure in the pressurized cavity to send water from the second vessel into the first vessel with the water jet, and wherein the watertight seal is configured such that water leaks between the first and second vessels if the watertight seal fails.

22. The method in accordance with claim 21, wherein the attaching of the first and second vessels comprises any of sonic welding the first and second vessels, solvent welding the first and second vessels, and mechanically fastening the first and second vessels.

23. The method in accordance with claim 22, wherein the forming of the first and second vessels comprises a plastic material, wherein the method further comprises reinforcing the first and second vessels with a plastic strengthening agent.

24. The method in accordance with claim 21, wherein the attaching the first vessel with the second vessel comprises a twin-sheet bonding process.

25. The method in accordance with claim 24, wherein the twin-sheet bonding process comprises:

bonding the first vessel with the second vessel; and

providing one or more openings between first and second vessels for air and water circulation.

26. The method in accordance with claim 21, further comprising forming a plurality of plumbing openings in the first vessel.

27. A system for a spa comprising:

a first vessel configured to hold water and one or more persons;

a second vessel attached to the first vessel, wherein the attachment comprises a twin-sheet bond between the first vessel with the second vessel; and

embedded channels between the first and second vessels for air and water circulation in the spa.

28. The system in accordance with claim 27, wherein a contour of an outer vessel wall at an area of the embedded channels protrudes outward from a sitting area of the spa.

29. The system in accordance with claim 27, wherein the embedded channels are effectively shrink-wrapped between the first and second vessels.

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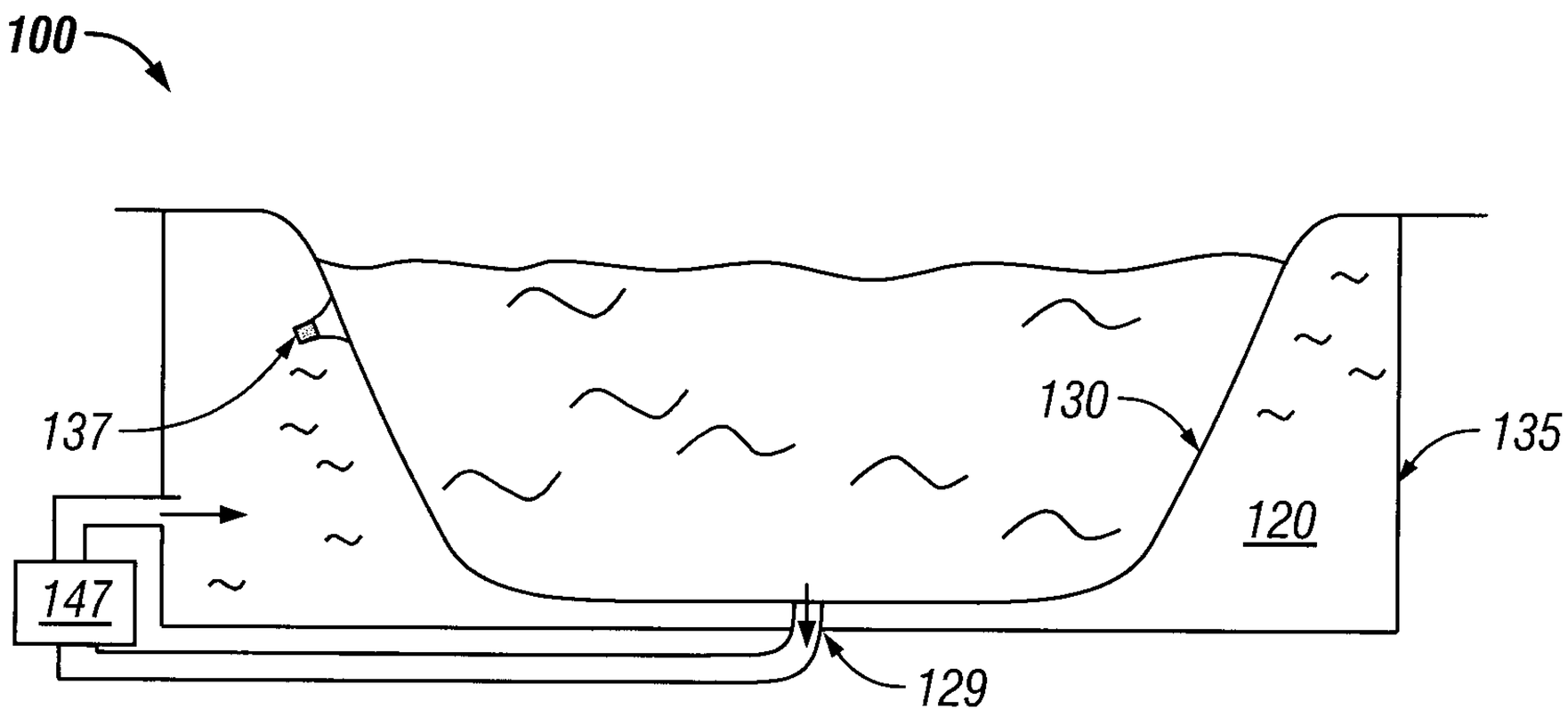


FIG. 1A

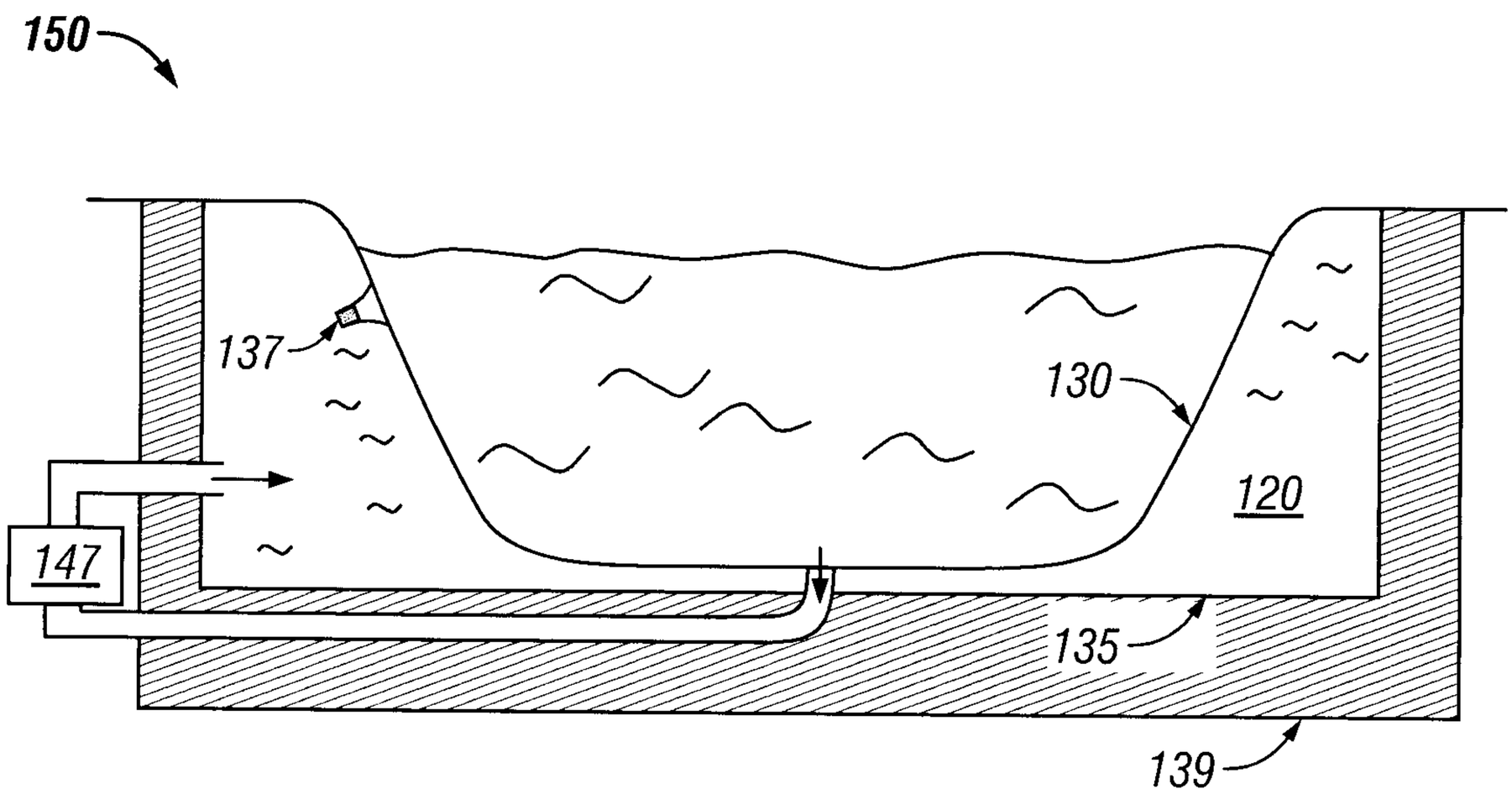


FIG. 1B

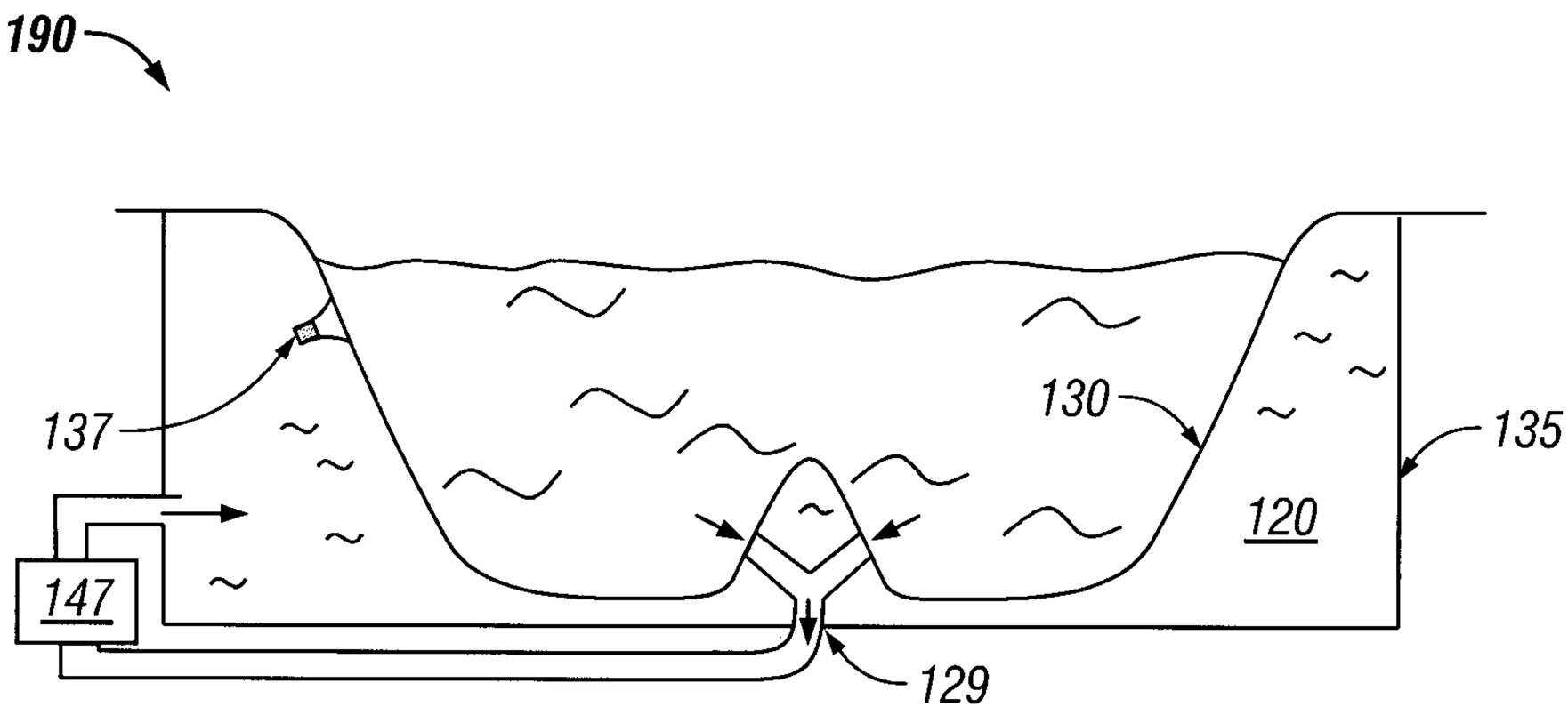


FIG. 1C

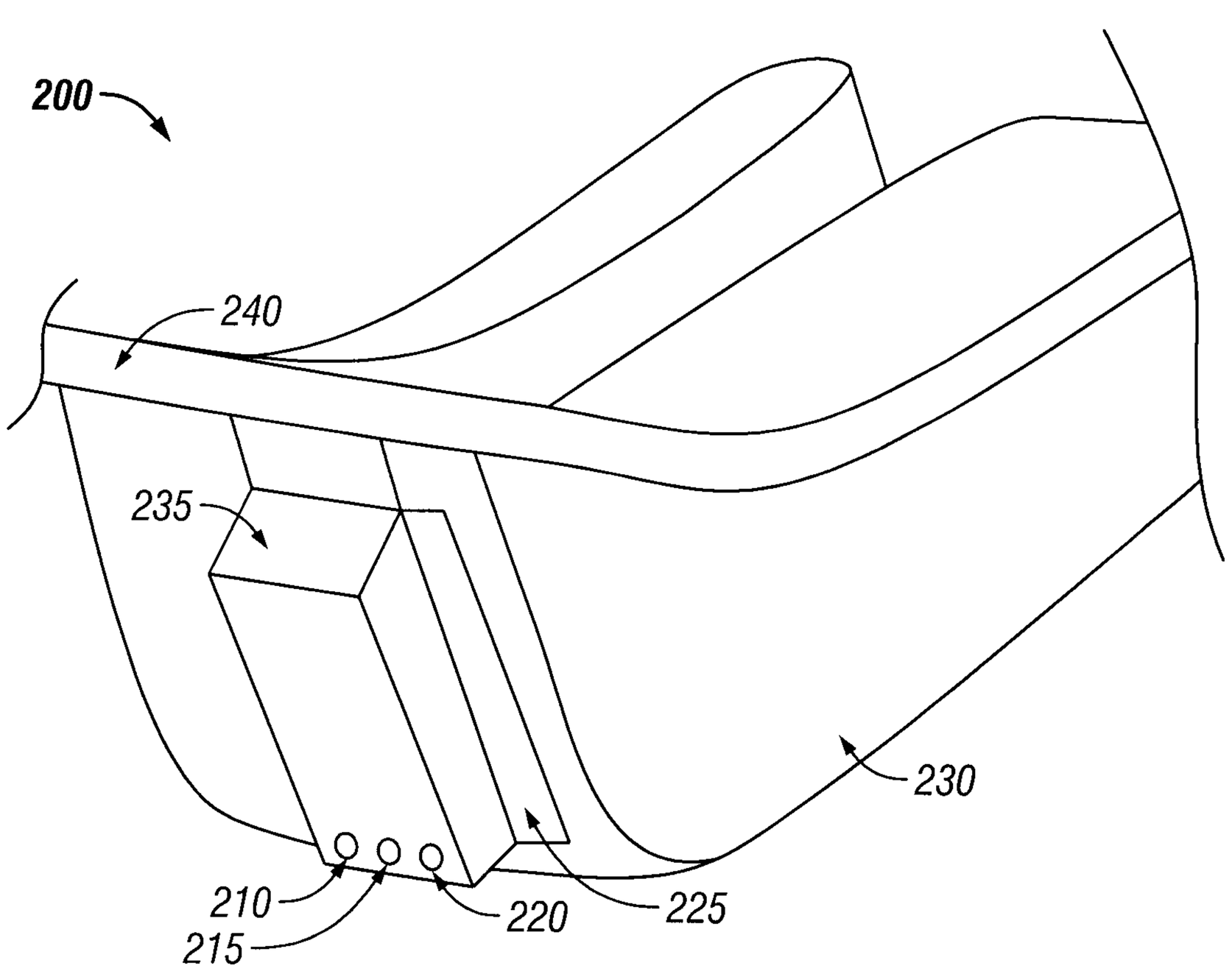


FIG. 2A

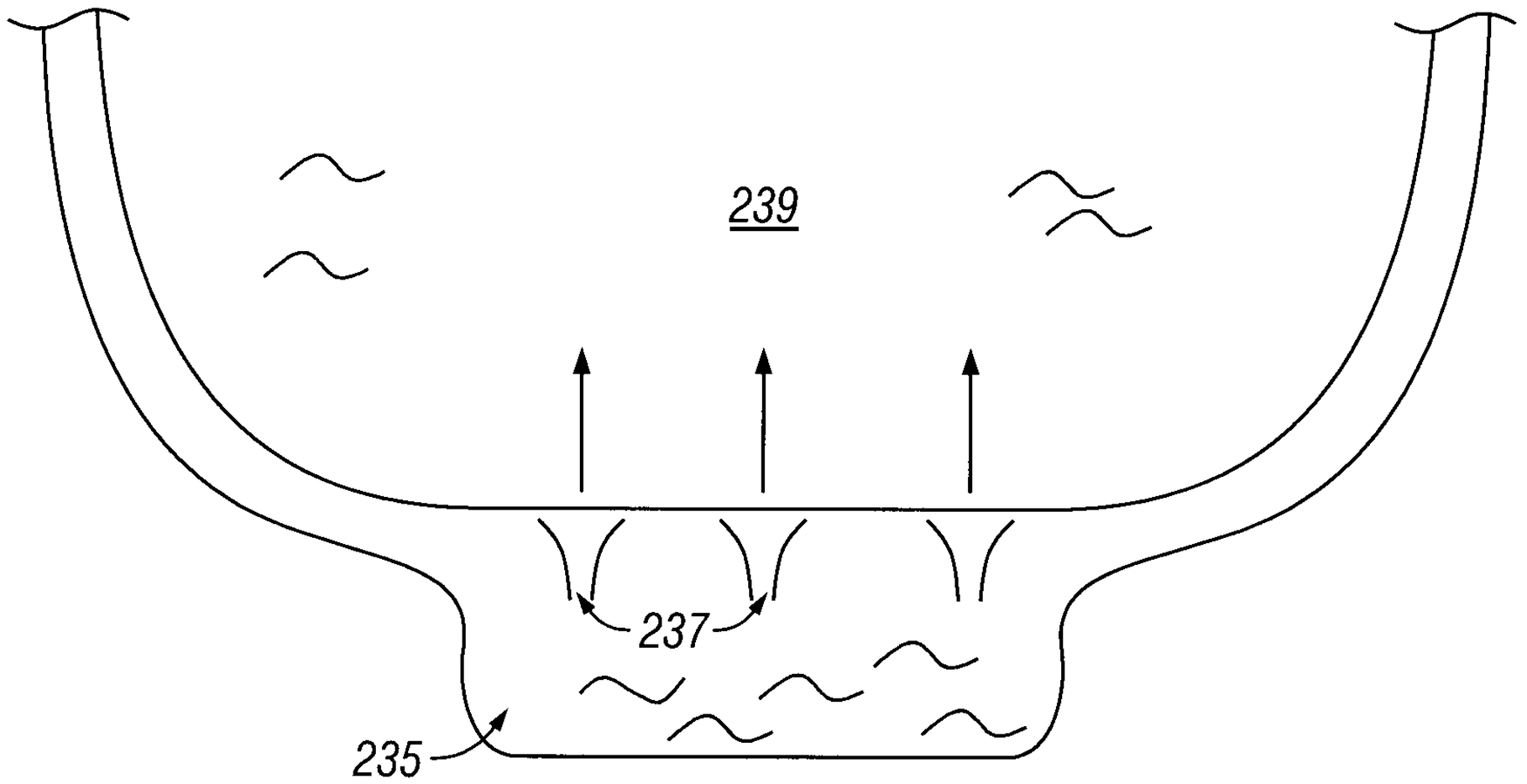


FIG. 2B

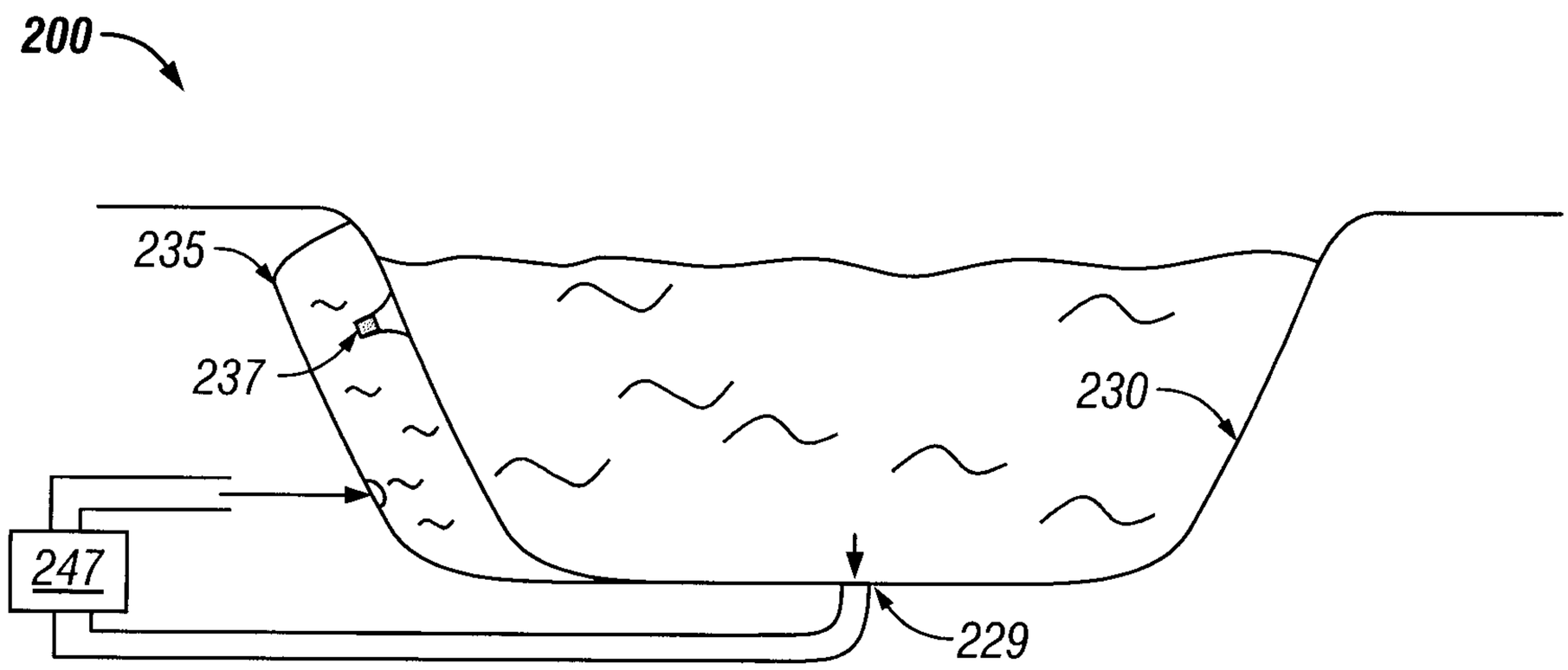


FIG. 2C

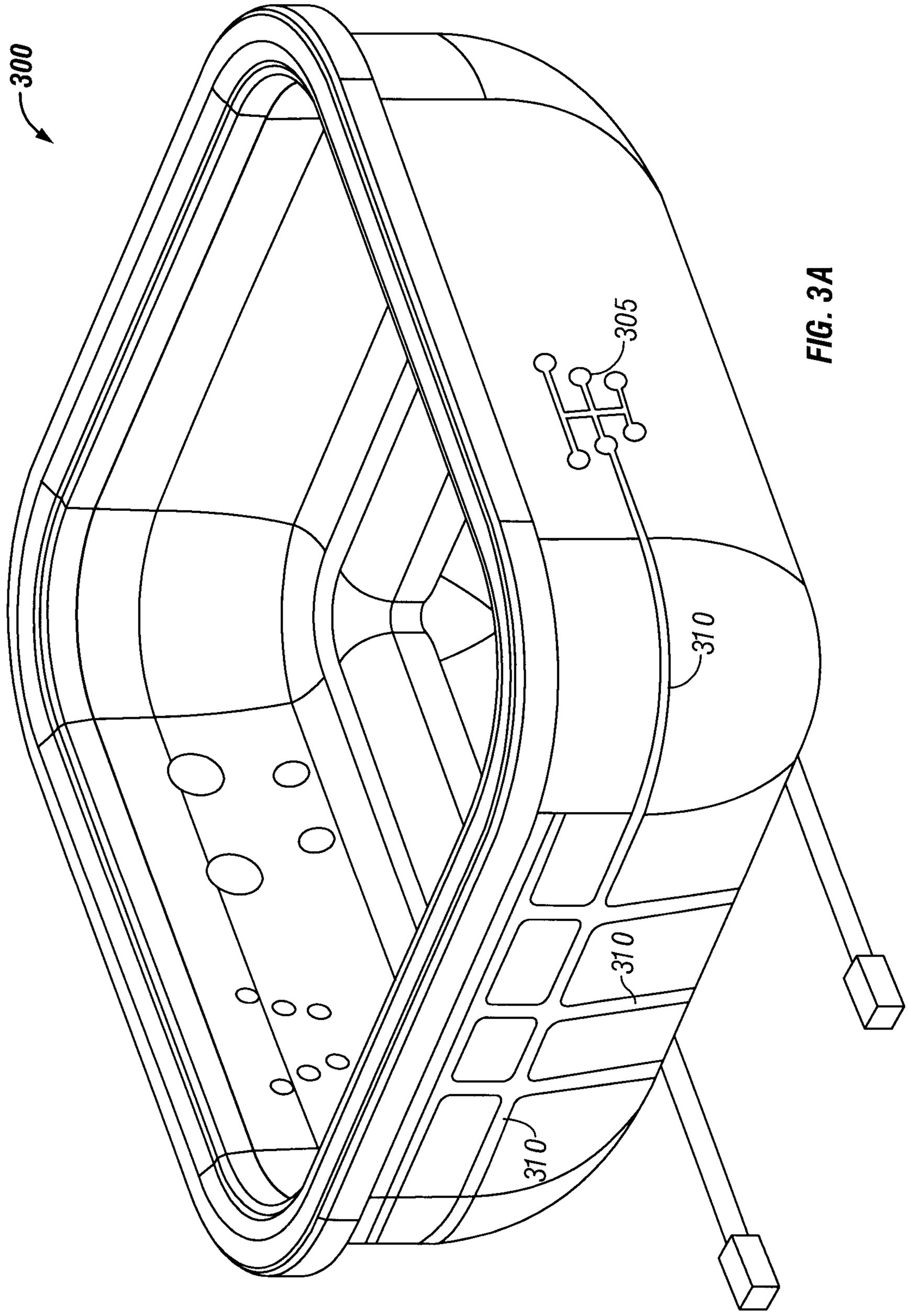


FIG. 3A

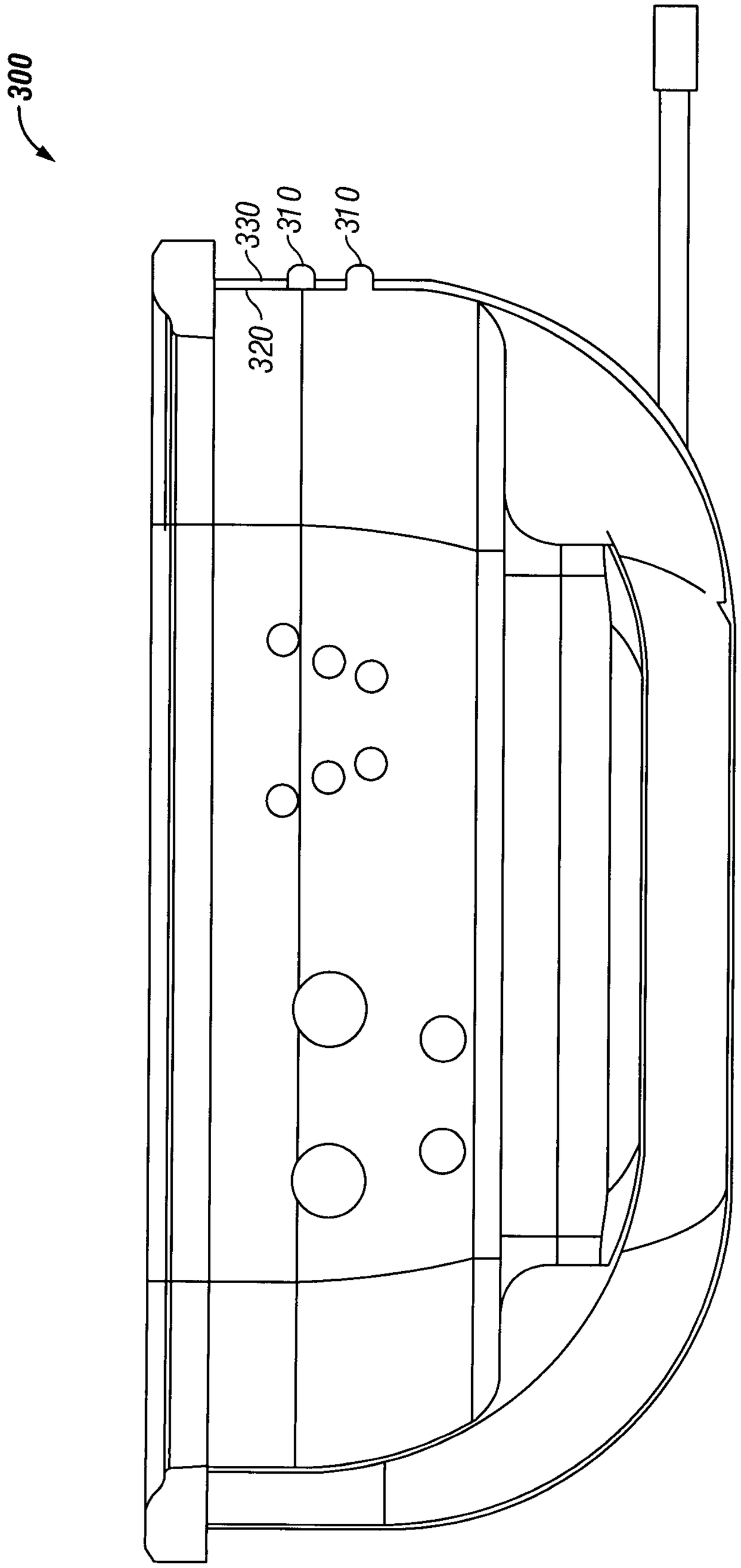


FIG. 3B

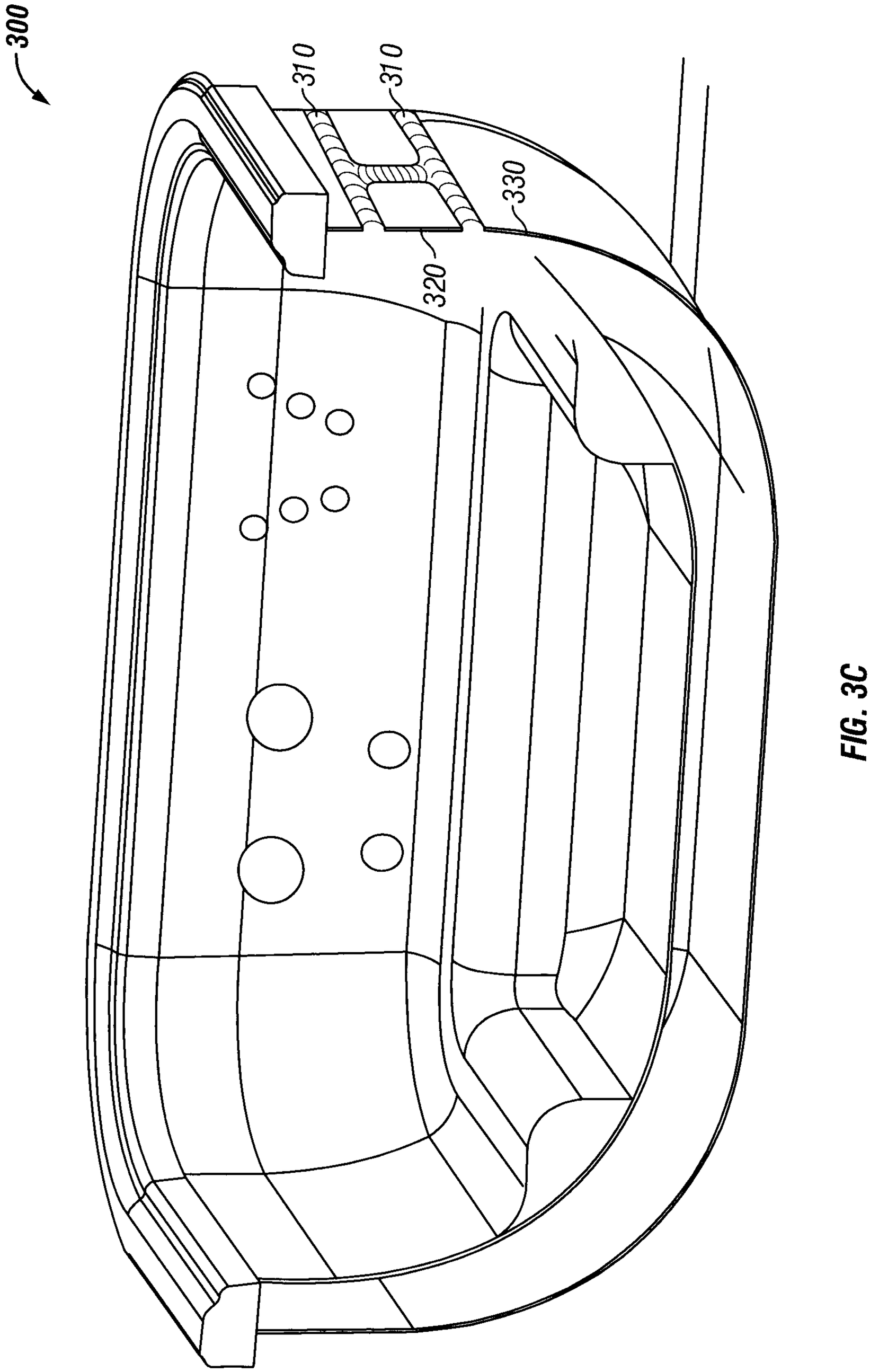
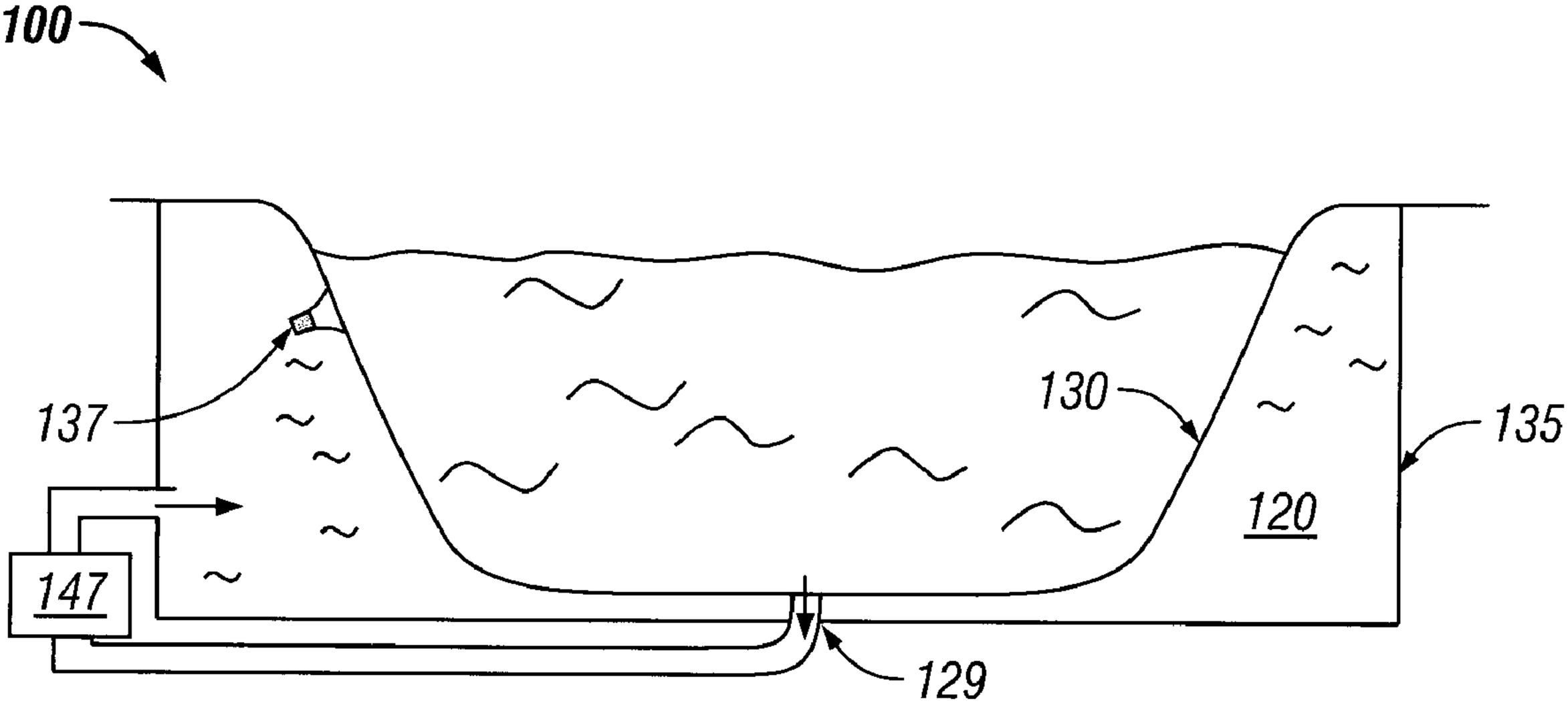


FIG. 3C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