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(54) **Bubble massage bathtub and drain control unit for use therewith.**

(57) A bubble massage bathtub, and a drain control especially well suited for use therewith are disclosed. In one embodiment, there are two cup-shaped plastic shells. Air channels are mounted between them, and apertures are provided through the top shell that communicate with the air channels. A hardened foam material is disposed between the second shells to support the channels and bind the shells together. Special ribs and inlet attachments are also provided.

A poppet valve is provided for the drain opening with a bendable cable that controls its movement. A guide extends around the end of the cable adjacent to the poppet and a remote control unit is connected to the other end of the cable. It is capable of causing the cable to both pull the poppet down and push the poppet up in response to rotation of a knob.

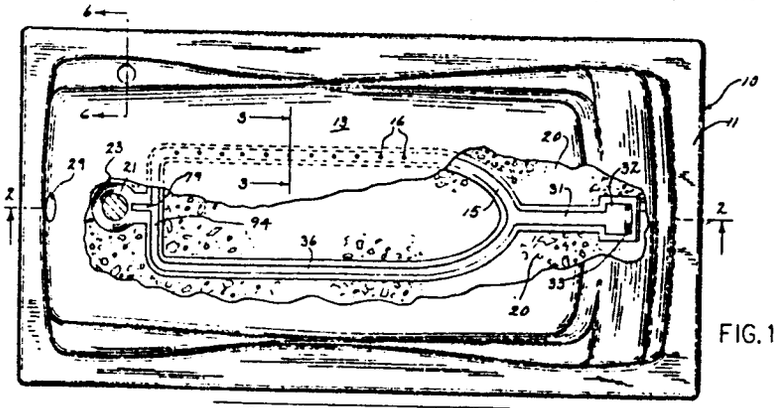

FIG. 1

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This invention relates to bathtubs that have a bubble massage feature, and rain control units which are particularly well suited for use therewith.

There are currently available several types of hydro-massage bathtubs wherein air conduits are positioned adjacent to the tub floor for purposes of bubbling air up through the water in order to provide a hydrotherapy massage. Such units, examples of which are shown in U.S. Patents 3,251,071 and 4,249,522, leave the unsightly air channels visible to the user, leave these channels poorly supported, or require the use of extra thick and expensive plastic panels for support.

The object of the present invention is to provide a bathtub of the above kind which is relatively inexpensive to produce, permits the use of extremely thin plastic outer shells as well as covering shrouds, is light-weight, provides superior support and protection for the air channels, and which hides the air channels from view.

The present invention provides a bubble massage bathtub comprising a first cup-shaped shell member having a bottom wall and surrounding side walls; air channel means mounted under the first shell member; and apertures extending through said first shell members in communication with said air channel means; characterized by a second shell member mounted under said air channel means and having a floor and side walls arranged

so as to receive said first shell member in a nesting relationship; a hardened foam material disposed between said first and second shell members and supporting said air channel means; and a drain opening extending through both of said shell members which is also in communication with the bottom wall of the first shell member and said air channel means.

Stopper systems have been developed for bubble massage tubs which can be remotely activated. One is shown in U.S. Patent 2,856,611. However, poppets of this type rely on a complex lever mechanism that is expensive and difficult to install. Further, the mechanism can be noisy to operate due to the abrupt shifting and/or have reliablity problems.

There are also available in connection with conventional tubs certain cable activated drain poppets as shown in U.S. Patent 4,411, 028. However, such cables are not connected to the poppet, and simply serve to cause a lever to shift the poppet up. Closing must therefore be accomplished by gravity or by a user stepping on the valve.

Accordingly, a further object of the invention is to provide apparatus for operating a bathtub poppet valve which is relatively inexpensive to construct, has positive opening and closing, and has a relatively quiet operation.

The present invention therefore further provides an apparatus for operating a bathtub poppet valve, of the type which is mountable in a tub drain for upward and downward movement in a vertically extending drain pipe, characterized by a bendable cable connected to said poppet for controlling its movement; a remote control unit connected to said cable which is capable of causing said cable to pull the poppet down and push the poppet up; said control unit having a housing

mountable on a wall, said housing having an axial bore; a sliding member mounted in the bore for axial movement, with its rotational movement being restricted, said sliding member also being connected to the opposite end of the cable from the poppet; a rotatable knob mountable to the housing; and a spindle extending axially between the knob and sliding member having threaded end; whereby rotation of the knob in either direction causes axial movement of the sliding member, movement of the cable and resulting vertical movement of the poppet.

A bubble massage bathtub of the present invention is very inexpensive to assemble, permits the use of extremely thin plastic outer shells, is lightweight, provides superior support and protection for the air channels and hides the air channels from view. In the preferred embodiment there is a reinforcing rib extending below the second shell floor which is in alignment with a portion of the air channel means. The rib is of a generally U-shaped cross sectional configuration and the air channel means projects down into the upper inside portion of the reinforcing rib. Further, a portion of the foam is positioned between the rib and air channel, inside the rib. With this structure, the rib and foam protect and support the air channel, while the air channel adds greater rigidity to the rib.

In another preferred embodiment, there is an inlet hole in the second shell member and a nut member disposed between the first and second shell members in alignment with the inlet hole. There is also a mounting pocket adjacent the nut for restricting its rotation. This permits the air supply conduit to be easily threaded to the air channel even when the second shell is so thin that it cannot support threads.

Through the use of the apparatus for operating a poppet valve both the air channel and the tub drain can be simultaneously opened and closed. Thus, when the tub is filled with water, air being pumped into the air channel can only go through the tub apertures so as to maximize bubbling. When the drain is open, the pumping air will then help to drive any dirty water out of the air channels into the drain.

Use of the cable, guide and remote control provide for a relatively inexpensive construction that has positive opening and closing. Also, noise is reduced due to the gradual opening and closing action.

In preferred embodiment a bearing sleeve is positioned between the sliding member and housing. Also, there can be an internal threaded bore in the sliding member that meshes with a lower threaded end of the spindle, the spindle can be mounted for rotation with the knob, and there can be a cap/bearing which connects to the housing and guides the rotational motion of the spindle.

These and still other features and advantages of the present invention will be apparent from the description which follows. In the following description, the preferred embodiments of the invention will be disclosed with reference to the accompanying drawings, in which:

Figure 1 is a top plan view (partially fragmented) of a bubble massage bathtub and drain control in accordance with the present invention;

Figure 2 is a view in partial vertical section taken along line 2-2 of Figure 1;

Figure 3 is a view in vertical section taken along line 3-3 of Figure 1;

Figure 4 is a view in vertical section taken along the line 4-4 of Figure 2;

Figures 5 and 5A are enlarged views of the drain control as shown in the closed and open positions;

Figures 6 and 6A are enlarged views in vertical section illustrating the actuator mechanism for the drain poppet, shown in two positions;

Figure 7 is a view in vertical section taken along line 7-7 of Figure 6;

Figure 8 is a view in vertical section taken along line 8-8 of Figure 6;

Figure 9 is an enlarged view in vertical section of the air inlet connection means shown in Figure 2; and

Figure 10 is an assembly view of the nut retaining member of Figure 2.

Referring first to Figures 1 and 2 of the drawings, the bubble massage bathtub 10 includes a first cup-shaped shell 11 which is received in a second shell 12 in a nesting manner. The first shell member 11 has a bottom wall 13, as well as side walls 14. An air channel means 15 is of a generally U-shaped configuration, and includes apertures 16 which extend through the floor 13. The second shell member 12 also has a floor 17 and complementary side walls 18. Transverse ribs 19 (see Figure 2) and longitudinal ribs 19A (see Figure 3) extend from the floor 17 of the lower or second shell member 12. A hardened foam material 20 of the polyurethane type is positioned between the first and second shell members.

Referring specifically to Figure 3, U-shaped plastic channel member 36 is secured by an epoxy adhesive to the lower surface of the bottom wall 13 of the first shell member 11. It has a portion disposed in an inner space of longitudinal rib 19A. This rib extends below the second shell member 12 floor. A portion of the foam material 20 also extends between the

U-shaped channel member 36 and the rib. The air channel can therefore provide extra support for the rib, and the rib protects, hides and supports the air channel.

In Figure 4, there is shown an optional means of providing a front decorative vertical panel or shroud 42 (for installations where it is desirable to hide the underside of the tub). An indented portion 38 is provided in a top rim of second shell member 12, and one or more clips 40 of a generally split T configuration are secured therein (such as by a suitable adhesive). Each clip member 40 includes teeth 41 which will frictionally engage an upper portion of the decorative front wall 42 to hold it securely in place.

A remote drain control 22 (see Figures 2, 6-8), and a double stopper valve 23 (see generally Figures 2 and 5) is operable in conjunction with an overflow unit (generally 27). Note also the overflow opening 29 in Figure 1. Overflow pipe 90 (see Figure 2) communicates with this opening 29 and is connected to the usual T connection 28, from which laterally extends a drain housing pipe 39.

The remote control 22 includes an outer housing 43 and bearing sleeve 44. The outer housing 43 has a hollow inner channel 93 with longitudinal slots 57 to receive longitudinal projections 72 of the bearing sleeve 44. In a similar manner, an inner sliding member 45 has projections 58 for longitudinal sliding in the bearing sleeve 44. This is best seen in Figure 7.

T-shaped guide 46 has a compartment 50 for slidably receiving a bar member 76 to which is connected an end of the wire 26 of the cable 25. Another compartment 51 receives the end portion of the cable 25.

The slidable bar 76 is in turn connected to sliding member 45 by a threaded connector 49. It will

be noted in conjunction with Figure 8 that guide 46 has projections 47 for engagement in complementary grooves in outer housing 43 (so as to prevent rotation). A cap/bearing 52 (see Figure 6) provides rotatable guidance for a spindle or stem 53 extending from the rotatable knob 24. The spindle is affixed to the knob to rotate therewith. External threads 77 on the bottom end of the rotatable spindle 53 will threadably engage internal threads 87 of the slidable body member 45. A flange 54 extending from the cap/bearing 52 will snap on a complementary groove in the upper portion of the outer housing 43 so as to form a compact cartridge unit. If desired, a threaded fitting could be employed in place of flange 54. A nut 55 will engage the threads 56 on the outer housing 43 to sandwich the tub wall.

Referring now to Figures 5 and 5A (the double stopper valve), it will be seen that the cable 25 is secured in the generally L-shaped guide 59 with the inner bendable wire 26 extending therefrom and attached to an H-shaped connector 60. A threaded T connector 61, having a large diameter portion 62 and a small diameter portion 63, is threaded to the connector 60. A lock disk 65 is threaded along with the larger diameter threaded portion 62 into the stopper body section 66.

A drain housing 66A is positioned to sealably engage the drain opening 21. It includes an apertured drain cover/screen 88. The stopper body section 66 includes an upper flange portion 86 and a lower flange portion 86A. The lower flange portion is provided with a peripheral seal ring 67 for sealably engaging valve seat member 68 on drain housing 66A.

A washer 70 is positioned between the drain pipe 39 and the bottom of the floor 17. It should be further noted that the U-shaped air channel extension 79 will interconnect the air channel means 15 to the drain opening 21. Lateral openings such as 80 are

provided in the drain housing 66A for this purpose.

The cable 25 is firmly secured in a side connection area 28 by an apertured nut 83 engaging a connector 84 having a conical sleeve member 85. The sleeve 85 frictionally engages the cable 25 upon a tightening of nut 83.

The outer housing member 43 of the remote control unit 22 can be inserted through a suitable opening in the first and second shell members 11 and 12 (or a bathroom wall) with the nut 55 making the attachment on one side and a flange member 86 at the opposite side. The cable 25 will then extend between the remote control 22 and the connection area 28 (see Figure 2).

As best seen in Figures 2, 9 and 10, at the opposite end of the bubble massage bathtub 10 is an air conduit 30 which is connected to the air channel means 15 (also 31, 32) by a nut 33. Nut 33 is fixedly positioned in a non-rotatable manner in an enlarged segment 32 of the air channel means 15. This feature permits the second shell to be exceedingly thin. (Forming threading in the sides of a hole through the second shell to receive the pipe is not required).

The air channel means 15 further includes air conduit 31 which extends down the side of the tub. In an especially preferred form, a connector 35 extends from air supply conduit 91 and through an opening 37 in the wall 18 to assist in the connection to the nut 33 (see Figure 10). Threads 34 achieve a coupling between these parts. Connector 35 also has an extension portion 81 with external threads 82 for engagement with the threaded nut 33. A washer 71 is also positioned between the connector 35 and the side wall 18 of the second shell member 12 as well as an additional support wall 78.

The nut 33 is secured in the enlarged passage portion 32 from the channel 36 by an insert section 73. It has a U-shaped flange 74 and a U-shaped inverted portion 75 for positioning against a portion of the nut 33 at the bottom thereof. It also has an upper support wall 78.

A better understanding of the advantages of the bubble massage bathtub and drain control will be had by a description of the operation and fabrication of the tub. While many materials are suitable, preferably the first shell member 11 will be vacuum formed from an acrylic plastic and the second shell 12 will be vacuumed formed of ABS (acrylonitrile-butadine-styrene) resin. Alternatively, shell 12 can be formed from any inexpensive plastic material such as polyvinyl chloride. To the bottom of the first shell member 11 and opposite the bottom wall 13 an acrylic-fiberglass composition layer will be applied. The nut 33 is positioned in the portion 75 prior to the insert section 73 being placed under the shell 11. The next step is to adhesively secure the U-shaped channel member 36 (composed of the same materials as shell 12) by an adhesive such as epoxy resin. The poppet and controls are made of conventional plumbing metals and plastics.

Adhesive will be applied between section 73 and side wall 18 as well as support wall 78 and side wall 14. With the nut 33 secured therein in a non-rotatable manner, the first and second shell members 11 and 12 will then be placed together in a nesting manner. The polyurethane foam 20 will then be injected between the two shell members and permitted to foam and harden to provide a sandwich type configuration. This secures the shell members 11 and 12 together, and supports the air channel.

The next step is to drill a series of holes 16

through the bottom floor 13 of the first shell member 11 (along the air channel means 15). Drain opening 21, overflow opening 29, and a control mount opening are drilled through both shells. The overflow pipe 90 can then be connected to the overflow opening 29 by a conventional attachment to secure overflow pipe 90.

The drain housing 66A can then sandwich the tub by connecting to the drain pipe 39. Connection 35 is then threaded into the nut 33 so as to permit later attachment to the air supply conduit 91.

With a suitable amount of water in the bathtub massage unit 10 (provided by conventional water supplies), the air will then be introduced under pressure into the enlarged passage portion 32 of the air supply means. It will flow downwardly through the air conduit 31 and through the U-shaped channel 36. Air will then flow upwardly through the apertures 16 to effect a bubble action in the water of the bathtub unit 10.

It will be appreciated that when the poppet 66 is not closed, air will flow out through the air channel extension 79 and through the air orifice 80 in the drain housing 66A, and consequently into the drain opening 21. However, it will not be able to do so when its passage is blocked by the engagement of seal ring 67 and the valve seat 68. When this occurs, water will also be prevented from flowing out of the bathtub (due to the positioning and the sealing engagement of the upper flange member). Compare Figures 5 and 5A.

When it is desired to empty the water in the bathtub 10 (as well to permit any accumulated water in air channel means 15 to drain out the air channel means) a lifting of the stopper body section or poppet 66 is required. This is effected in a gradual and positive manner by a rotation of the knob 24.

As the knob is rotated, the stem 53 is carried with, causing the external threads 77 to move into the internal threads 87 of the sliding member 45. Since the sliding member cannot rotate, this causes a downward movement thereof. Compare Figures 6 and 6A. This in turn will push the wire 26 of the cable 25 upwardly in the guide 59. This results in an upward motion of the flange 86 away from the drain housing 66A, and the flange portion 67 away from valve seat 68. When this occurs, both the water in the air channel means 15 and the contents of the bathtub flow downwardly through the drain opening 21 and into the drain pipe 39. The process is of course reversed for closing the tub. Note especially that the rotation of the knob and the guide 59 permit a bendable wire to be able to push as well as pull poppet 66.

Thus, the invention provides a unique construction for reducing the required material thickness needed of expensive, relatively rigid plastic panels. It also provides a very uncomplicated, lightweight, and solid construction. The air channels can be protected inside reinforcing ribs, and the channels in turn support the ribs.

In other embodiments, provisions for easily connecting an air supply can be made, notwithstanding that the thin outside shell is too thin to support threads in a bore through it. Also, a unique poppet control can be provided which is quiet in operation, inexpensive and simple in construction, easy to install, and permits positive opening and closure of the valve.

While certain preferred embodiments have been described above, it will be readily apparent to those skilled in the art that a number of other modifications and changes can be made without departing from the scope of the invention. For example, the spindle could be

rigidly attached to the sliding member with the threads at the upper end. The knob could then have a central bore that interacts with the spindle upon rotation of the knob. Another alternative would be to form insert 73 with flange 74 integral with side wall 18 or to provide suitable supporting webbing or ribs for this purpose as well as for support wall 78. If desired, nut 33 could be molded with the wall 18. Yet another alternative would be the elimination of the connector 35. Air supply tube could be supplied with a threaded bolt end to engage the nut 33. Further, a transverse rib 19 could accommodate the transverse portion 94 of the air channel means 15 in the same manner and with the foam 20 as indicated in Fig. 3 with respect to the longitudinal rib 19A.

CLAIMS

1. A bubble massage bathtub comprising a first cup-shaped shell member (11) having a bottom wall (12) and surrounding side walls (14); air channel means (15) mounted under the first shell member (11); and apertures (16) extending through said first shell members (11) in communication with said air channel means (16); characterized by a second shell member (12) mounted under said air channel means (15) and having a floor (17) and side walls (18) arranged so as to receive said first shell member (11) in a nesting relationship; a hardened foam material (20) disposed between said first and second shell members (11, 12) and supporting said air channel means (15); and a drain opening (21) extending through both of said shell members (11, 12) which is also in communication with the bottom wall (13) of the first shell member and said air channel means (15).

2. The bathtub of Claim 1, characterized by a reinforcing rib (19) extending below said second shell floor (17) which is in alignment with a portion of said air channel means (15), said rib (19) being of a generally U-shaped cross sectional configuration, said air channel means (15) projects down into the upper inside portion of said reinforcing rib (19).

3. The bathtub of claim 1 or 2, characterized in that a portion of the foam (20) is positioned between the rib (19) and said air channel means (15) inside the rib.

4. The bathtub of claim 1, 2 or 3, characterized by a double stopper valve (66, 67, 68) positioned in said drain opening (21) for simultaneous sealing engagement with said floor (13) and said air channel means (15).

5. The bathtub of claim 4, characterized by

by a bendable cable (25) connected to said valve (66) for controlling its movement; a remote control unit (22) connected to the opposite end of said cable (25) which is capable of causing said cable to both pull the valve down and push the valve up; said unit (22) having a housing (43) mountable on a wall, said housing having an axial bore (93); a sliding member (45) mounted in the bore for axial movement, with its rotational movement being restricted, said sliding member (45) also being connected to said opposite end of the cable (25); a rotatable knob (24) mountable to the housing; and a spindle (53) extending axially between the knob and sliding member (45) and having a threaded end (77); whereby rotation of the knob in either direction causes axial movement of the sliding member (45), movement of the cable (25), and resulting vertical movement of the valve; whereby said valve is made to seal off and unseal the drain opening (21) and said air channel means (15).

6. The bathtub of any of claims 1 to 5, characterized by inlet means operatively associated with said air channel means (15), said inlet means having an inlet hole in said second shell member (12), a nut member (33) disposed between said first and second shell members (11, 12) in alignment with the inlet hole, and a mounting pocket (75) adjacent said nut (33) for restricting its rotation, said pocket (75) being formed by a retaining member (73) positioned between said shells (11, 12).

7. The bathtub of claims 1 to 6, characterized in that said foam (20) is a resinous plastic foam, and both of said shells (11, 12) are made of plastic, the lower side of the first shell (11) having a fiberglass coating.

8. An apparatus for operating a bathtub poppet valve, of the type which is mountable in a tub drain for upward and downward movement in a vertically extending drain pipe, characterized by a bendable cable (25) connected to said poppet (66) for controlling its movement; a remote control unit (22) connected to said cable (25) which is capable of causing said cable (25) to pull the poppet (66) down and push the poppet up; said control unit (22) having a housing (43) mountable on a wall, said housing having an axial bore (93); a sliding member (45) mounted in the bore (93) for axial movement, with its rotational movement being restricted, said sliding member (45) also being connected to the opposite end of the cable (25) from the poppet (66); a rotatable knob (24) mountable to the housing (43); and a spindle (53) extending axially between the knob (24) and sliding member (45) having a threaded end; whereby rotation of the knob (24) in either direction causes axial movement of the sliding member (43), movement of the cable (25) and resulting vertical movement of the poppet (66).

9. The apparatus of claim 8, characterized in that there is an internal threaded bore in the sliding member (45) that meshes with the threaded end of said spindle (53).

10. The apparatus of claim 8 or 9, characterized in that a bearing sleeve (44) is positioned between the sliding member (45) and housing (43); and there is a cap bearing (52) on the housing (43) for connection to the housing and for guiding the rotational motion of the spindle (53).

FIG. 1

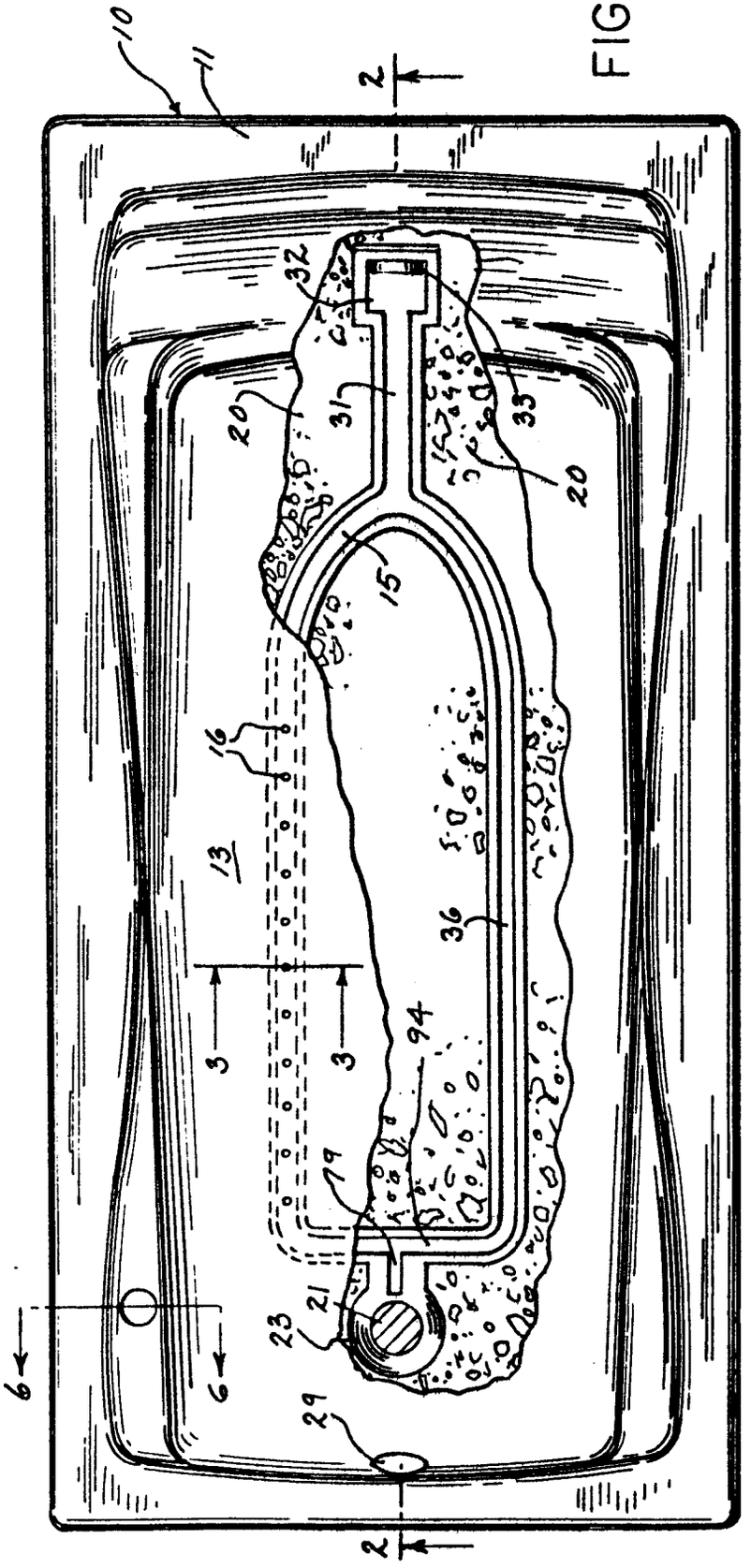


FIG. 4

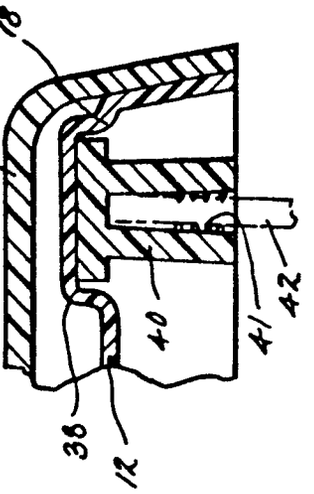
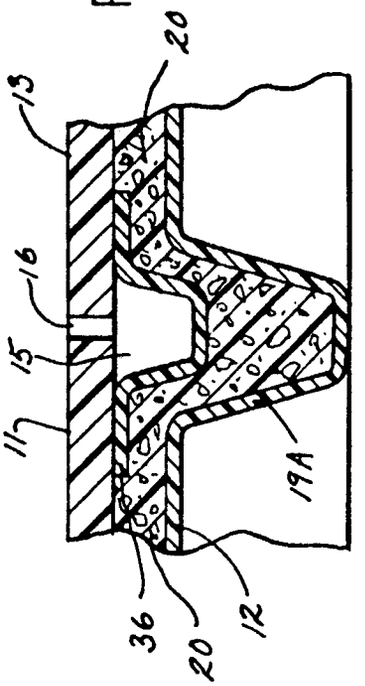


FIG. 3



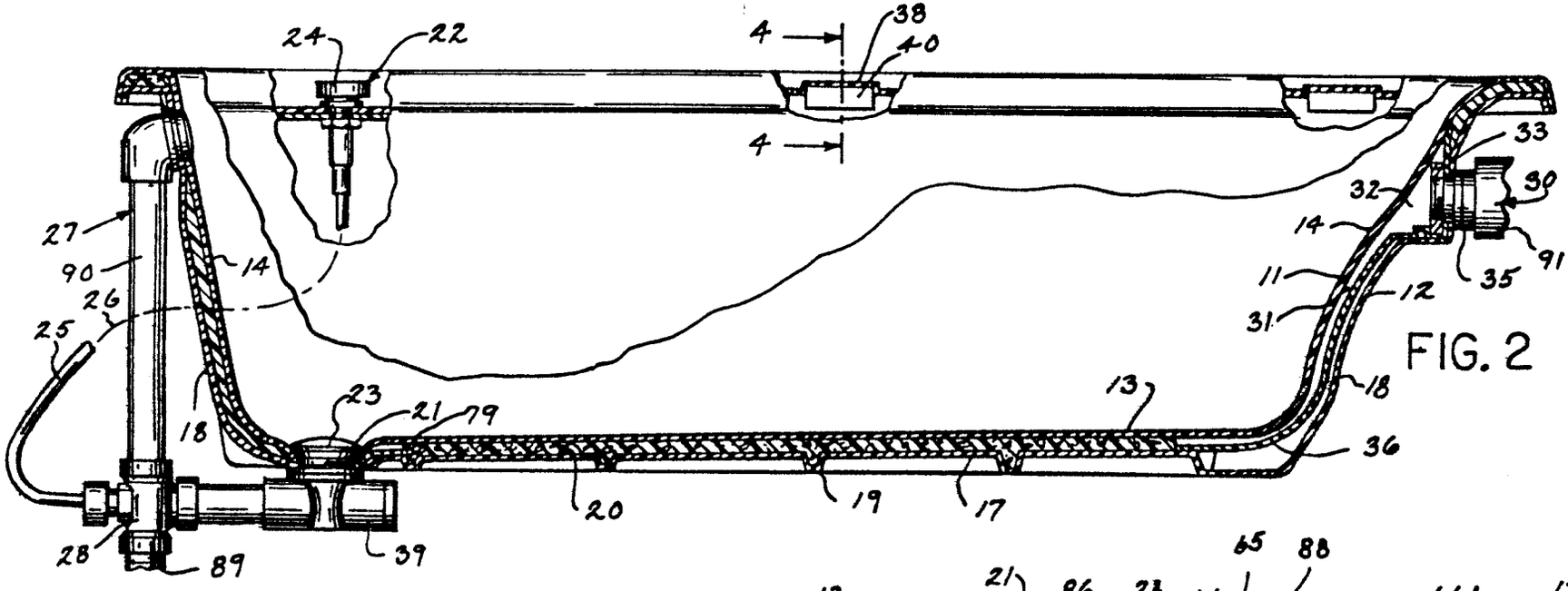
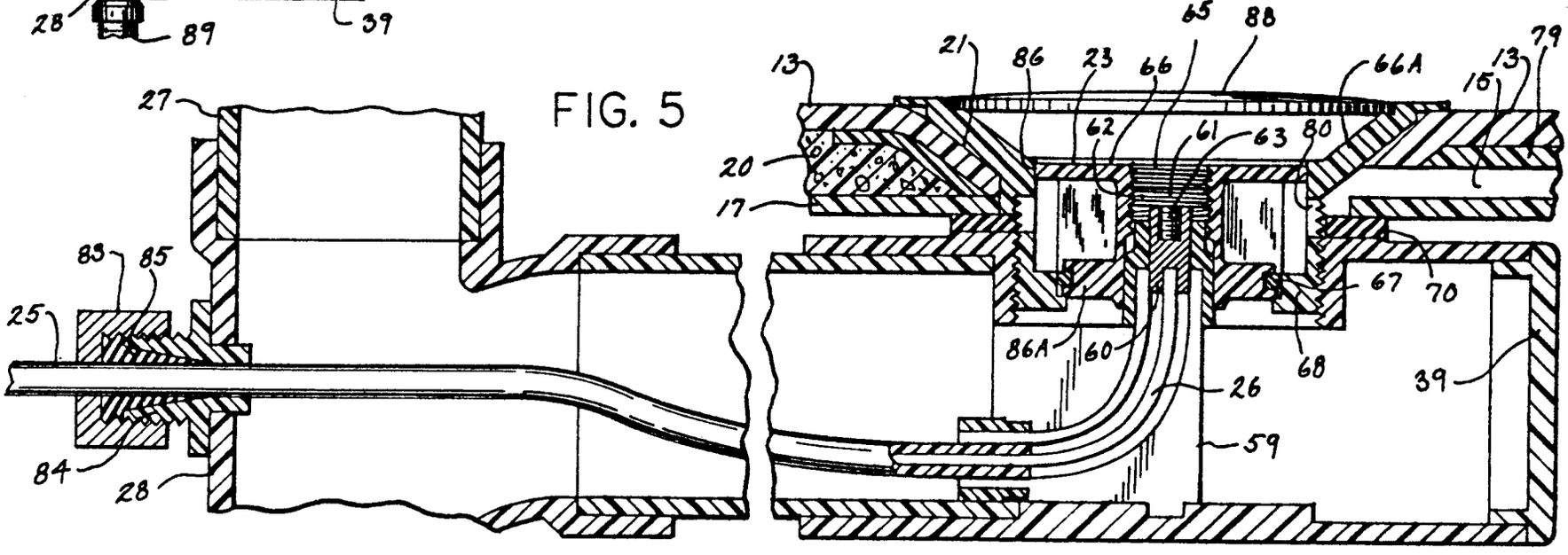


FIG. 2

FIG. 5



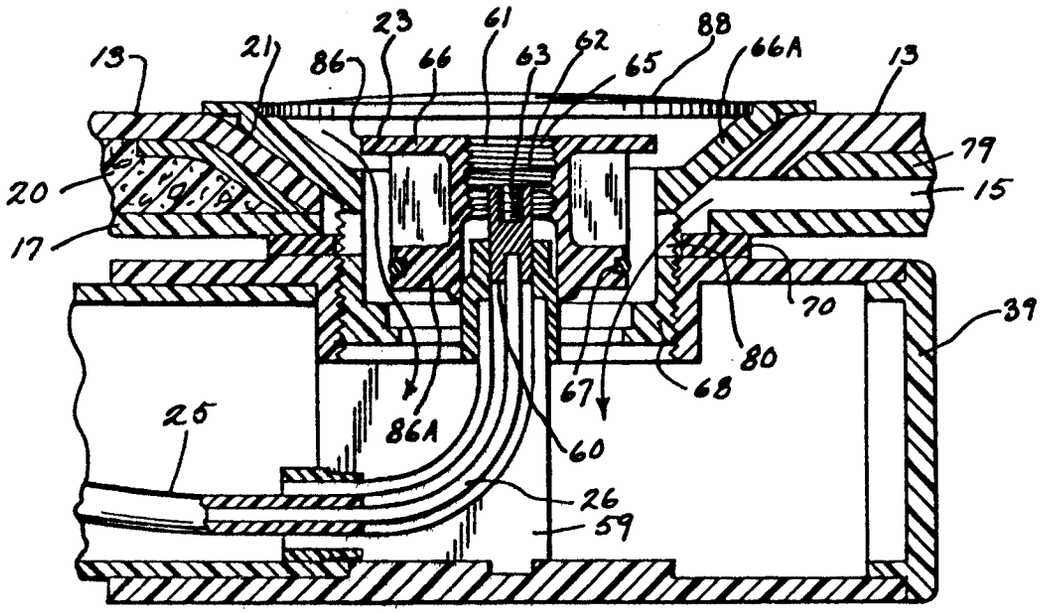


FIG. 5A

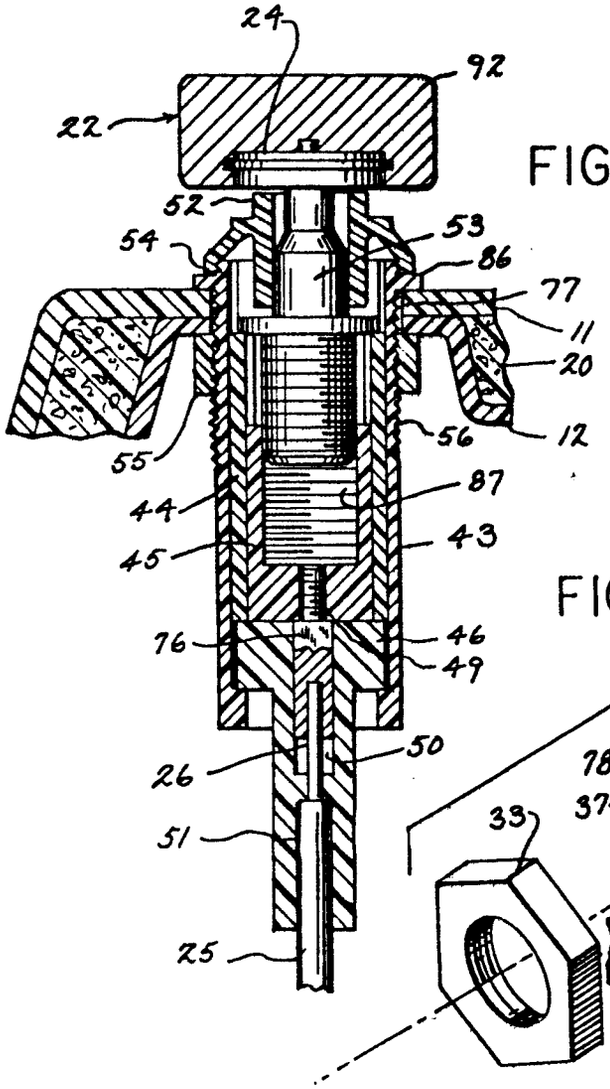


FIG. 6A

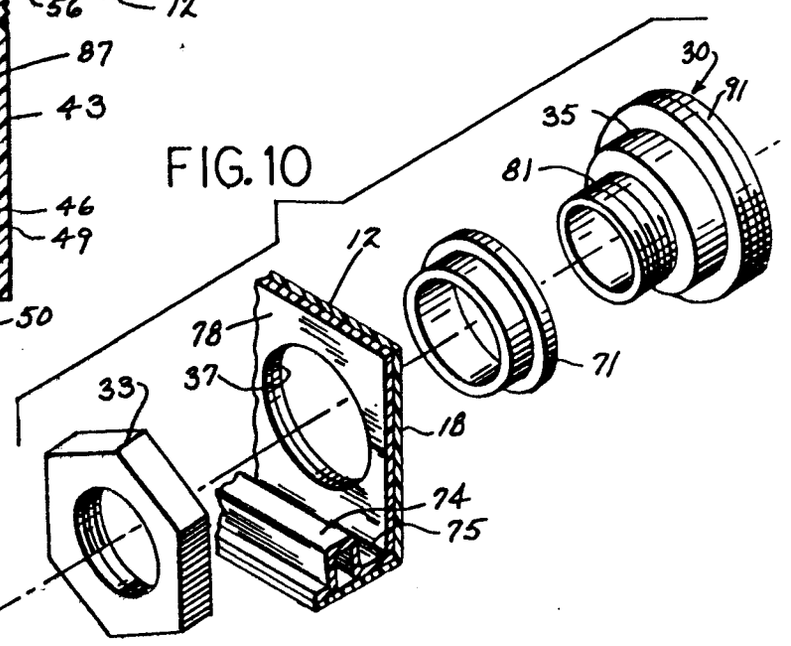


FIG. 10

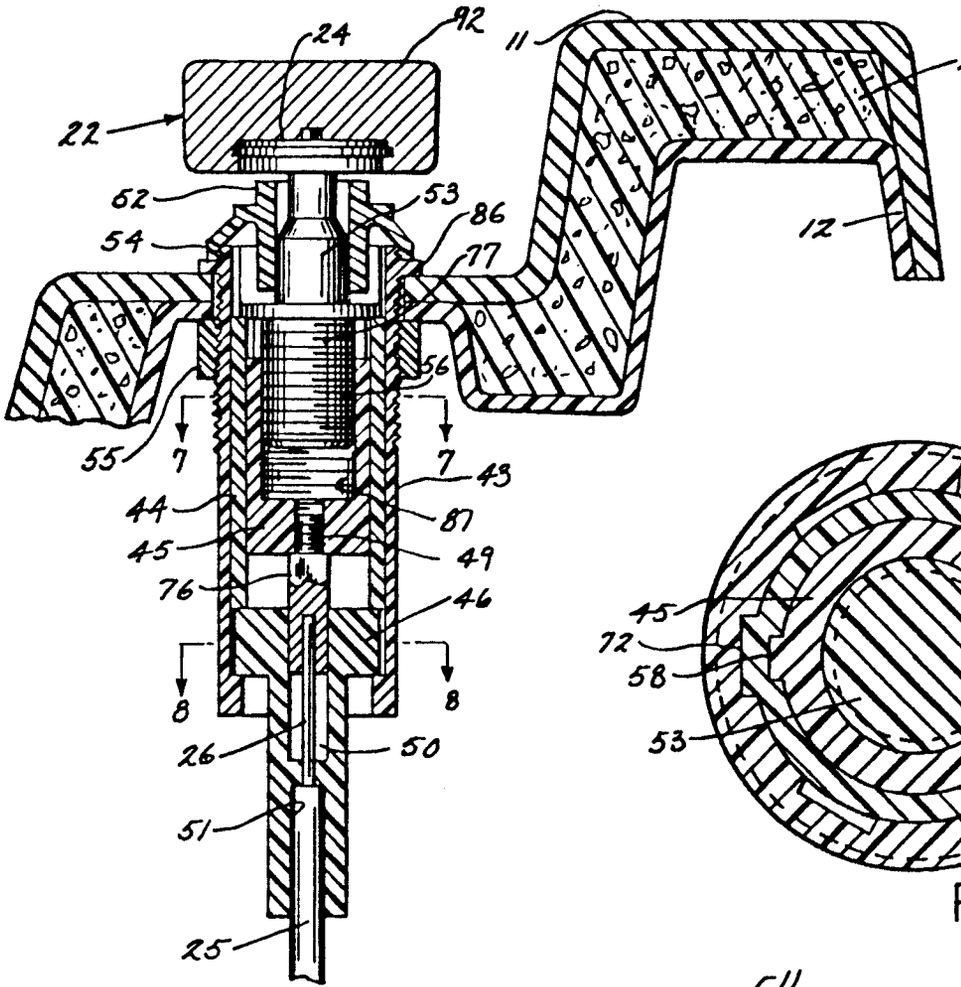


FIG. 6

FIG. 7

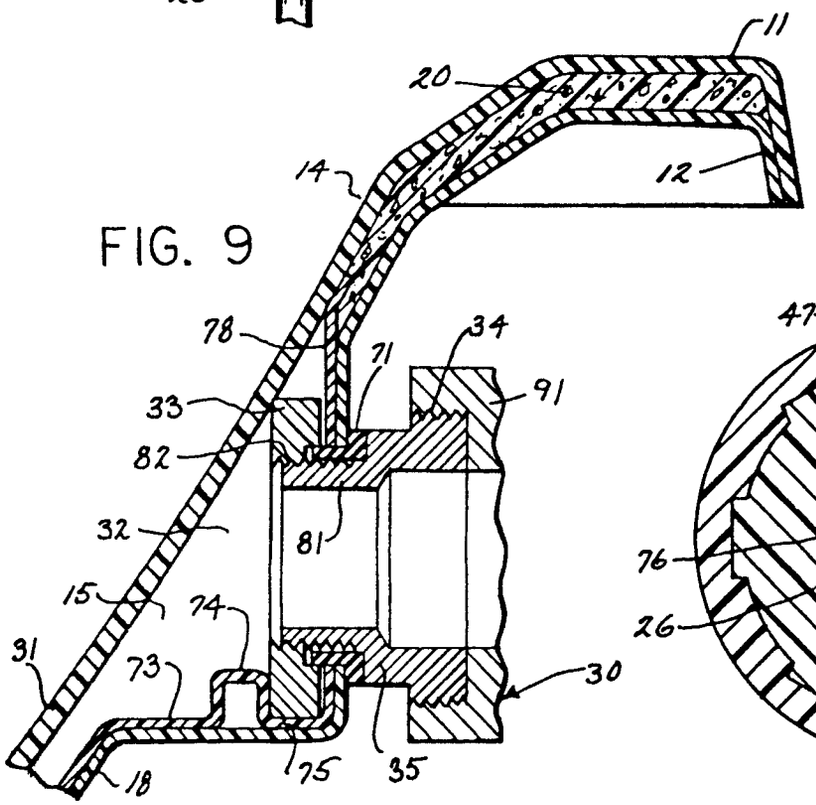


FIG. 9

FIG. 8