April 27, 1965 N. F. KELLER 3,180,301

AUTOMATIC BOAT DRAIN

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Fig. 1.

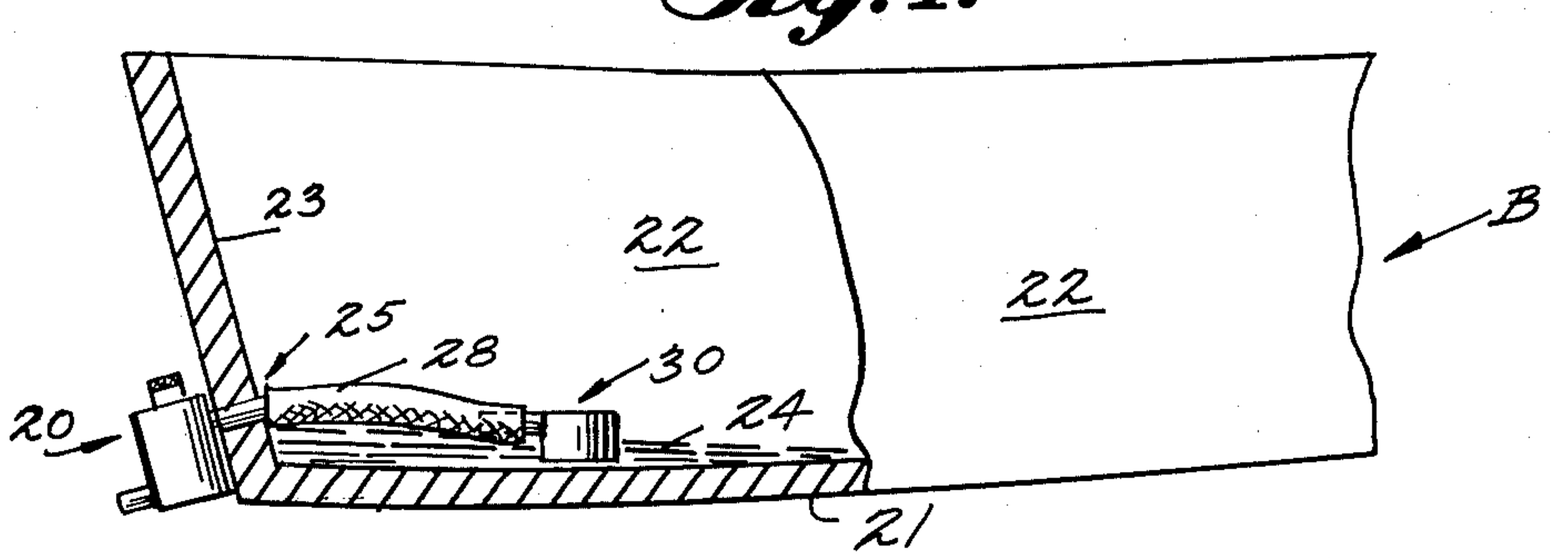
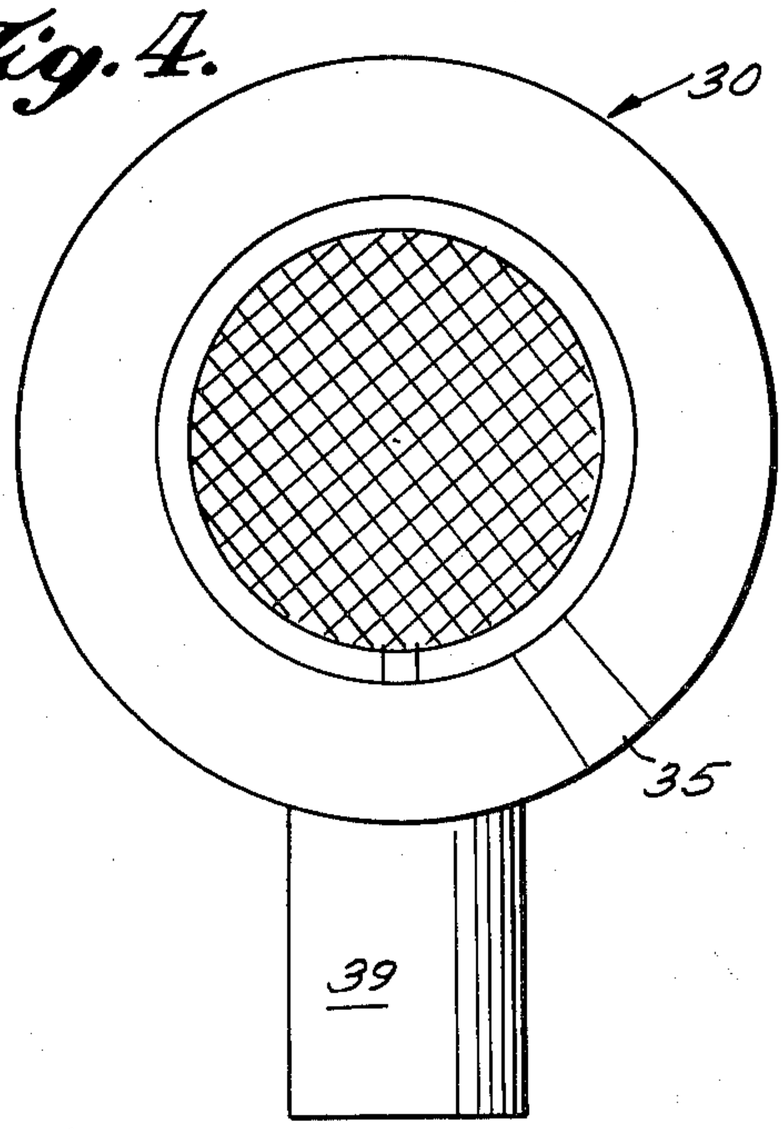


Fig. 2.

Fig. 4.



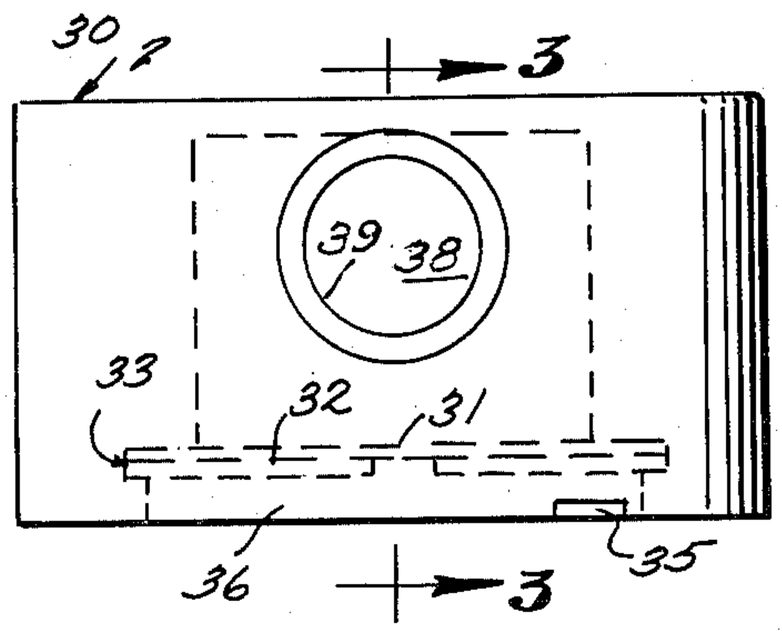
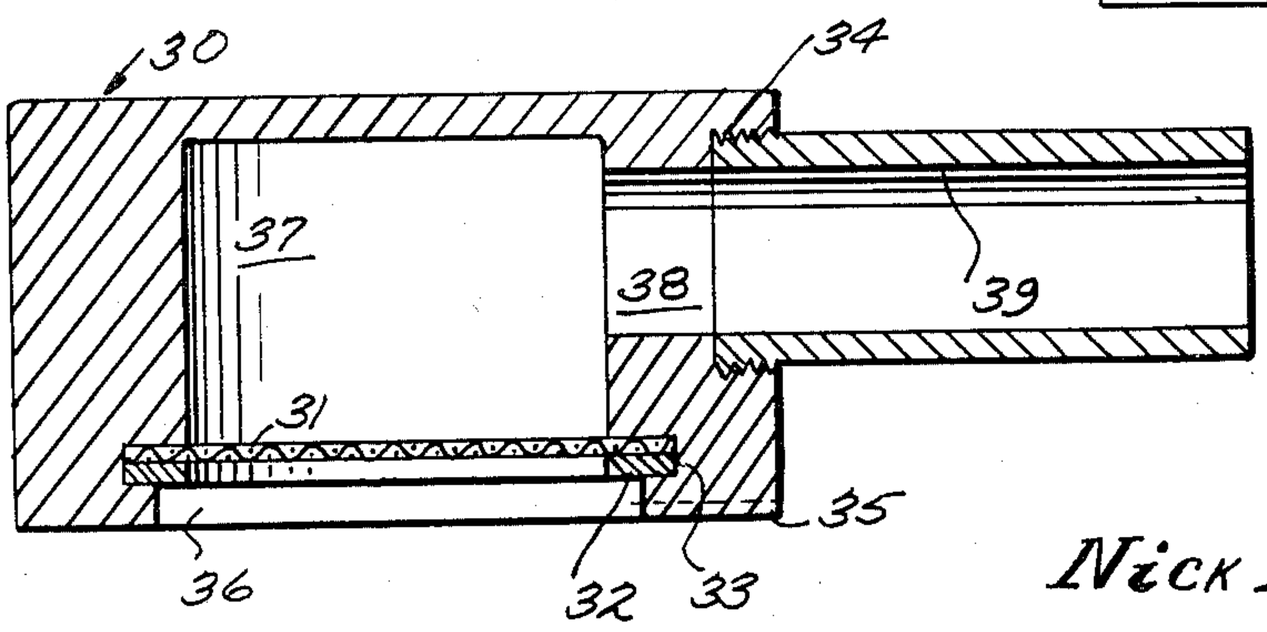


Fig. 3.



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AUTOMATIC BOAT DRAIN

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Fig. 10.

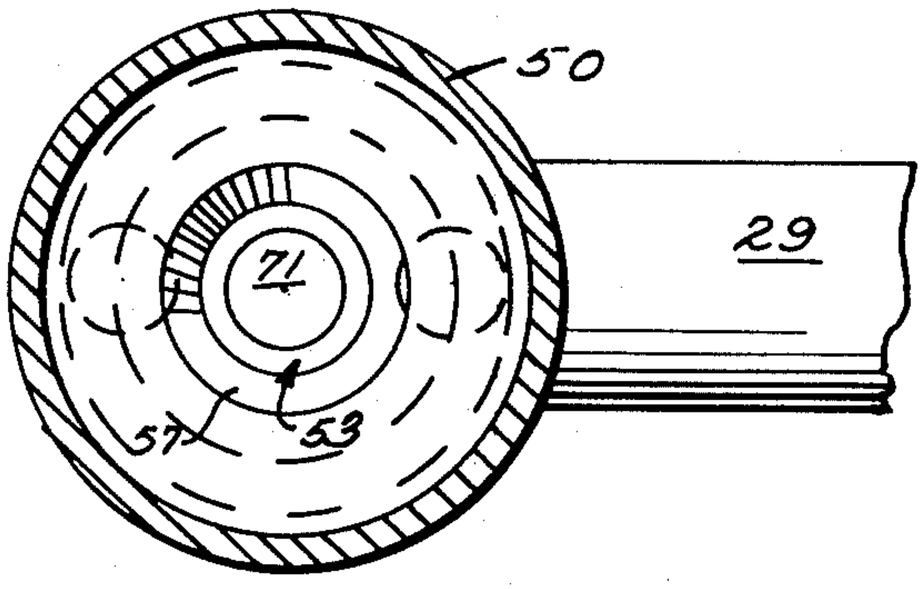


Fig. 9.

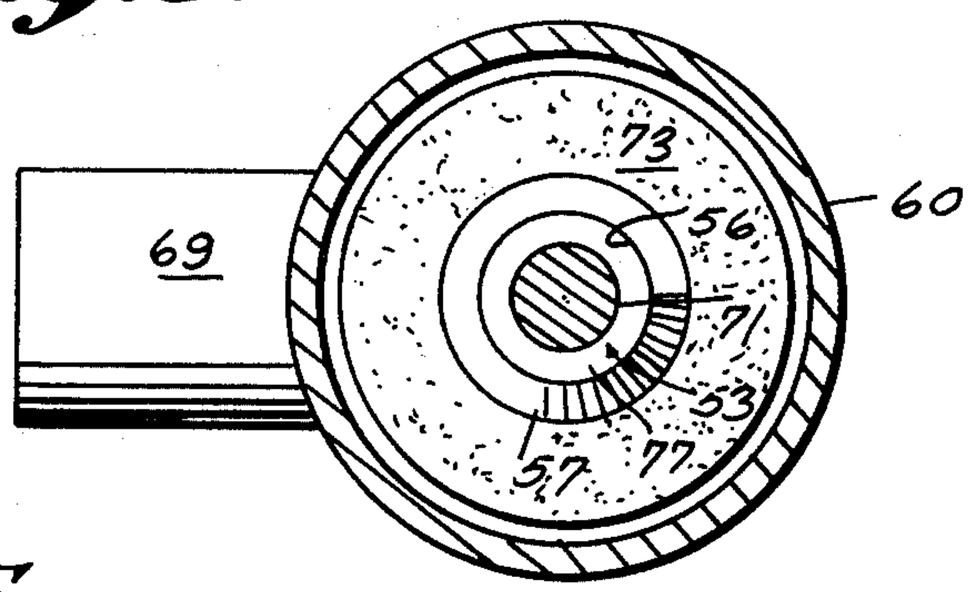
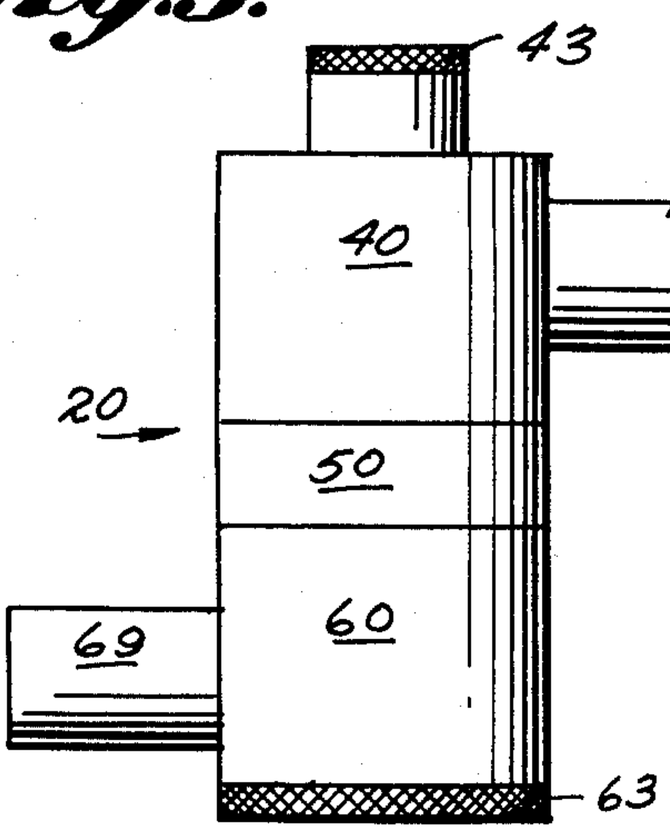


Fig. 5.



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AUTOMATIC BOAT DRAIN

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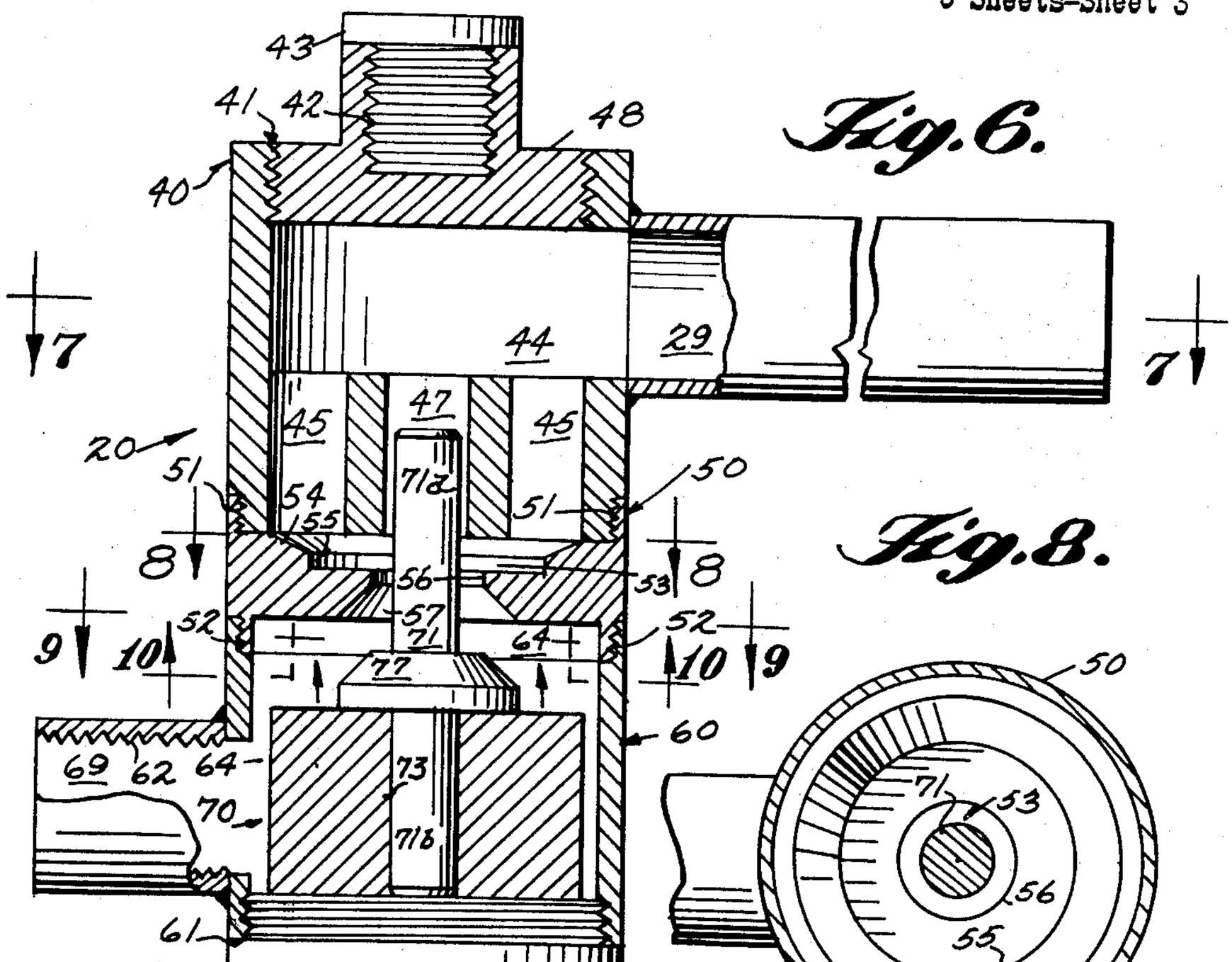
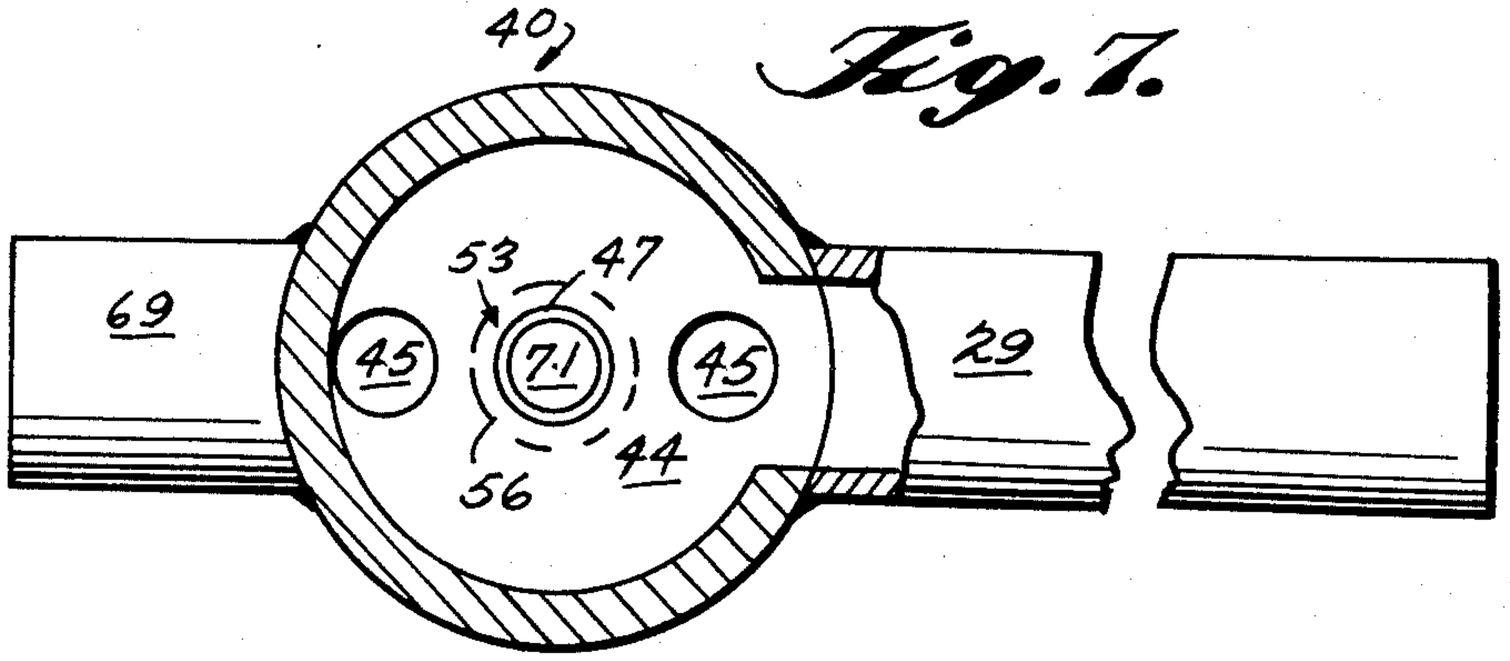


Fig. 6.

Fig. 8.

Fig. 7.



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United States Patent Office

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AUTOMATIC BOAT DRAIN

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Filed July 17, 1963, Ser. No. 295,755
8 Claims. (Cl. 114—185)

The present invention relates to automatic boat drains. More particularly, the present invention relates to automatic boat bailers for use in speed boats, and the like, which operate to suck water from the boat bilge by means of suction created by movement of the boat through the water.

The development of the power boat has made it possible to provide means operated by rapid movement of the boat through the water whereby a valve which closes an opening the bottom of the boat when the boat is at rest will open automatically as the boat moves, to allow bilge water to flow out from or be drawn out of the boat and thereby reduce, or at least maintain bilge accumulating from rain, spray, waves and leakage, at a constant level. Such automatic drains, founded on Bernoulli's famous engineering principle on the mechanics of fluid flow, have been under development for many years since the advent of the power boat. Automatic drains however, while sound in principle, have been found unsatisfactory in practice since the ideal conditions necessary for proper operation of such drains seldom exist, that is, a secure closing of the drain while a boat is at rest, and an immediate partial vacuum or suction as soon as the boat is not at rest. For example, a boat at rest in water is never really "quiet" due to wind, tides, eddying currents and waves. Thus, the small float valve upon which virtually all automatic boat drains rely for secure closing while a boat is at rest, is seldom securely closed because the boat is constantly moving to and fro with short rocking movements, which are insufficient to cause an amount of suction necessary to draw out water, but provide just enough suction to encourage the float valve to open and permit water to seep therepast. Waves and wind also cause a boat to rock and sway from side to side and bob up and down, each upward sway and each upward bob being sufficient to raise the boat at least slightly in the water, creating suction or a decrease in upward floatation or buoyancy pressure on the float valve that also encourages it to open and allow water to seep past.

Thus, with the use of prior art automatic boat drains, water would also get into a boat through seepage past the float valve of an automatic drain during virtually any weather conditions such that it would be necessary to pump the boat out, or raise it out of the water and remove the factory drain plug and let water run out, or use a sponge or suction or any of the other commonly known means of removing the bilge water. All of these methods of course require the time and attention of a person, and for this reason a completely automatic boat drain is still desired which may be attached to the boat permanently and which will require no attention to operate it.

Known automatic boat drains are also objectionable from still other standpoints. Some such drains for example are provided with elements retained beneath the boat bottom. This construction causes considerable resistance or drag in the water which tends to decrease the speed and performance of the boat. Since configurations are also objectionable since they can be easily damaged by underwater objects.

In some of the known automatic drain devices, attempts to solve leakage problems have resulted in the use of rubber and other non-metal valves and valve seats. Such valves are unsatisfactory since in efforts to make automatic boat drains which include a rubber valve for example, it has been found that the rubber begins to stick when left sitting in water for several days. Valves provided by round metal and non-metal balls have also been found objectionable in that the round shape of the ball tends to hamper water flow past the ball valve and valve seat.

It is therefore an object of the invention to overcome the defects of prior art boat drains and provide a simple, inexpensive, and practical means by which water will be automatically discharged from the interior of a boat when the boat is subjected to any motion.

Another object of the invention is to provide an automatic drain for a boat with means for positively closing the drain when the movement of the boat is insufficient to provide for the automatic discharge of bilge water from the interior thereof.

Other and further objects and advantages of this invention will become more apparent to those skilled in the art when reference is had to the accompanying disclosure and drawings.

The objects of this invention are achieved by providing an automatic boat drain combination of a valve casing mounted against the rear, outer face of the transom of a boat, with a pipe extending through the transom, connected by a hose to a filter casing supported with its screen in spaced relation to the bottom of the interior of the boat, with the provision in the outer casing of a float-actuated valve. The present boat drain is also equipped with a filter to prevent interference from trouble-causing foreign matter, and with a manual "lock off" in case of emergency.

In more detail, the present automatic boat drain consists of two separate parts which are attached together by means of a flexible hose. One of these parts, the filtering agent, may be movably disposed inside the boat; while the other part, the automatic draining mechanism, is firmly attached to the outside of the boat. The filtering agent inside the boat keeps sand, seaweed and other impurities from getting into the working mechanism of the externally disposed automatic boat drain mechanism since impurities, if large enough, may foul the automatic mechanism. The automatic draining mechanism is preferably attached in a permanent manner, either with bolts or screws, to the outside transom of the boat and is attached as close to the bottom and as near the center of the transom as possible.

Turning now to the drawings:

FIGURE 1 is a side elevational view of the automatic draining mechanism and filtering agent installed in a suitable boat;

FIGURE 2 is an end view of the filtering agent;

FIGURE 3 is a detailed view, in cross-section, of the filtering agent;

FIGURE 4 is a bottom view of the filtering agent;

FIGURE 5 is a side view of the automatic drain mechanism;

FIGURE 6 is a detail side view of the automatic drain mechanism, partly in section and somewhat enlarged;

FIGURE 7 is a top view of the automatic drain mechanism, partly in section and taken along lines 7—7 in FIGURE 6 to show some constructional features;

FIGURE 8 is a view similar to FIGURE 7, but taken along the lines 8—8 in FIGURE 6;

FIGURE 9 is another sectional view, similar to FIGURES 7 and 8, but taken along the lines 9—9 of FIGURE 6; and

FIGURE 10 is a bottom sectional view of the automatic drain mechanism, partly in section, and taken along lines 10—10 in FIGURE 6 to show other constructional features.

Turning now to FIGURES 1 to 4 of the drawings, there is seen a boat indicated generally at B and having a bottom hull **21**, side hulls **22** and transom **23**. According to this invention, there is disposed in and attached to boat B an automatic boat drain comprising automatic drain mechanism **20**, a filtering agent **30**, and flexible connecting hose **28**. As shown, filtering agent **30** is resting at a distance somewhat above bottom hull **21** and in bilge water **24**, and filtering agent **30** and flexible hose **28** are connected to automatic drain mechanism **20** by means of a hole **25** in transom **23**.

The filtering agent, indicated generally at **30**, is round and is machined in such a manner that a screen **31** can be attached therein by means of an expandable C-washer **32** in groove **33** such that water flowing to the automatic draining mechanism will pass through this screen and thereby hold impurities from entering the automatic draining mechanism. In the machining of the filtering agent, provision is made as at **34** for attaching a tube **39** to which the hose **28** is connected, to carry bilge water **24** from the filtering agent to the automatic draining mechanism. The filtering agent thus is provided with lower chamber **36**, upper chamber **37**, and side outlet chamber **38**.

There could be variations of design of the filtering agent such as having the connecting tube **39** attached to the top rather than to the side, or the connecting tube **39** could be attached at an angle rather than straight. The design would make very little difference so long as the filtering agent, while in use, is kept airtight and the screen is mounted beneath the level of water to be sucked out of the boat, to provide an uninterrupted flow of water to the automatic draining mechanism. Additionally, filtering agent **30** may be provided with one or more bilge water inlets **35** around the periphery of lower chamber **36** in cases where means are not otherwise provided to support the filtering agent at a distance above the inside bottom of boat hull **21**.

Turning now to FIGURES 5 through 10, it is seen that the automatic boat drain mechanism indicated generally at **20** is principally composed of upper chamber section **40**, central section **50** and lower chamber section **60**.

Upper chamber section **40** is provided with upper chamber **44** for receiving bilge water from inlet pipe **29**. The upper chamber is sealed at the top by coaction of screw threads **41** with upper plug **48**, which is primarily intended to provide a tight seal and keep water and air from entering or leaving the chamber **44**, etc. However, in the upper plug, provision is made by way of threaded opening **42** to carry a threaded safety or manual "lock off" plug **43** which, in case of faulty operation of the valve or seat, could be removed and screwed into the open end of the lower drain outlet **69** which is threaded with a matching thread **62**, as noted hereinafter to prevent water from entering the boat if the valve face or valve seat (described hereinbelow) failed.

Upper chamber **44** is also provided with bilge water drain channels **45** to connect upper chamber **44** to central section **50** and thereafter through drain channel **53** to lower section **60** as described hereinafter. Although upper chamber **44** is shown having a cylindrical form with a vertical axis, it is to be understood that upper chamber **44** may be cylindrical with a horizontal axis, or any other shape prepared by casting and/or boring through the upper opening closed by upper plug **48** or through the opening provided at inlet pipe **29**. It is also to be understood that while inlet pipe **29** is shown connected to upper chamber section **40** by means of welding, suitable threads may be provided in upper chamber section **40** to receive a threaded inlet pipe.

Turning now to central section **50**, there are shown screw threads **51** and **52** for joining the three sections **40**, **50** and **60** together. Alternatively, welding, brazing, soldering, screws or nuts and bolts may be used to accomplish this joining. The bilge water drain channels **45** of section **40** are connected through central section **50** to lower chamber section **60** by means of drain channel **53** defined by upper tapered opening **54**, annular openings **55** and **56**, and the tapered opening provided by valve seat **57**.

Also shown in the drawing is a lower plug **63**, attached to lower chamber section **60** and sealed therein by coaction with screw threads **61**. The purpose of the lower plug is to keep water and air from entering or leaving the chambers and it also serves as a stop for the valve mechanism **70** to prevent it from dropping too low and out of the valve guide hole **47** and away from valve seat **57**. Besides providing a sealing function, lower plug **63** also facilitates the assembling of the entire apparatus as will become apparent. Bilge water passing down from sections **40** and **50** flows into lower chamber **64** and then into lower drain outlet **69**. As shown, lower drain outlet **69** can be provided with screw threads **62**, equal in pitch to threads **42**, for receiving safety plug **43** for use in instances where the present draining mechanism may become unexpectedly fouled.

As shown, lower chamber **64** receives the valve mechanism indicated generally at **70** and which has been inserted for example through the opening provided by removing lower plug **63** from screw threads **62**. Valve mechanism **70** is composed of a central valve shaft **71** having integral upper and lower shaft sections **71***a* and **71***b* respectively. A buoyant material **73**, such as Styrofoam is attached to lower shaft section **71***b* by means of any suitable adhesive, such as an epoxy cement. Finally, the central portion of valve shaft **71** is provided with an annular extension having a tapered face portion **77**.

The design of the valve mechanism **70** and the valve seat **57** is such that the valve face **77** must engage the valve seat properly as the buoyant material **73** causes the valve to raise against the valve seat. Guide hole **47** in upper section **40** controls the movement of the valve mechanism as it slides up and down by coaction with upper valve shaft section **71***a*. Guide hole **47** and valve shaft section **71***a* have very little clearance, and as a result the valve mechanism seats properly against the valve seat **57** regardless of the bouncing and swaying action of the boat. As noted, buoyant material **73** is attached to projection **71***b* on the lower part of the valve and construction of the valve mechanism, valve seat **57** and buoyant material keeps all three in alignment at all times. The drawing illustrates (FIG. 6) the valve in an open or water passing position.

The operation of the automatic boat drain will now be described in detail. This description will cover a full cycle, from the time the boat is stopped, through the momentum interval when the water is draining and then when the boat is stopped again.

It is to be understood that the self-bailing device is capable of being embodied in boat hull designs of both relatively flat planing types and displacement types, the former being constructed to cause the bottom to literally lift out of the water as the forward speed is increased, while the displacement type rides somewhat deeper in the water and pushes the water aside as it moves forward, it being well known that a floating object is bouyed up by the weight of water displaced and that the weight of water displaced is essentially equal to the weight of the object in the air.

While the boat B (see FIG. 1) is standing still in the water and has no forward momentum, the entire automatic draining mechanism **20** is submerged under the sur-

face of the water. Water from a lake or other body of water enters the lower chamber **64** through the outlet tube **69**. As the lower chamber fills with water, the bouyant material **73** floats, and as this buoyant material rises, it also raises the valve mechanism **70** until the valve face **77** seats into the valve seat **57**. The valve face and the valve seat are both machined to have mating surfaces and for example, may have a 45 degree taper which has been found suitable for present purposes. As the valve and seat are machined together, when they contact each other all water flow into the boat is prevented. The water pressure exerted against the valve mechanism from the lake has no effect on the operation of the valve. The more pressure the harder the push is against the valve seat from the valve face and it is this action of the valve mechanism against the seat which prevents water from entering the boat when the boat is stopped and the automatic drain is under water.

When the boat starts moving forward, even at a slight rate of speed, water can no longer engulf the rear of the transom **23** whereon the automatic drain mechanism **20** is mounted. Because the drain works on gravity flow temporarily, water flows out of lower chamber **64** through lower drain outlet **69** and into the lake. The absence of water in the lower chamber allows the valve mechanism to fall away from the valve seat. When this happens, there is no restriction to the flow of water, and the valve mechanism and valve seat are in the position shown in FIGURE 6. As the boat starts its forward momentum, the bow raises slightly and any water which may be in the boat moves toward the rear of the boat. There being nothing to prevent the flow of water, the valve mechanism being away from the valve seat, the pull of gravity then causes bilge water to flow through the filtering agent **30** through the flexible connecting hose **28**, through the inlet pipe **29** and into the upper chamber **44**. From there it flows down through the channels **45** in central section **40**, through drain channel **53** and around the valve seat and out around the valve face where there is clearance when the valve is in the open position. The bilge water comes past the valve seat and into the lower chamber **64** and then on out into the lake through the lower drain outlet **69**.

It is to be remembered that action of the present automatic boat drain is initiated by water pressure from inside the boat which causes the drain to start operation, as opposed to existing devices where an element is disposed in the water to induce suction and cause such devices to operate.

If the boat continues to gain in speed, its bow begins to lower as momentum increases and when the boat reaches its planing speed it rides fairly level in the water, the bow being raised slightly and this keeps water fairly well to the rear of the boat. The entire automatic drain mechanism is airtight and thus there already is water running from the force of gravity. The lower drain outlet is lower than the filtering agent with the result that the force of gravity which started the water running becomes the force that keeps it running because of a syphon action. The water will continue to flow out of the boat until all water is removed, air gets into the various chambers, or the boat is stopped.

When the boat is stopped, water again enters the lower chamber from the lake. As the lower chamber fills with water, buoyant material **73** again raises the valve mechanism against the valve seat which shuts off any flow of water back into the boat.

It will thus be seen that the several foregoing objects and advantages have been satisfied by the present invention, and that the present automatic drain mechanism is a boat accessory which can be easily attached to an existing boat with very little cost and substantially no boat modifications. Moreover, the present device uses a flat metal valve and valve seat to provide for maximum water outflow rates, and to prevent sticking. The necessary buoyancy of the valve is caused by a separate buoyant material capable of raising the valve into the valve seat.

The present device is situated on the transom of boats where it is protected by the boat and the motor and/or propeller shaft, and obviates a need for dependent structures in the water to cause suction since it is started in operation by virtue of pressure rather than suction. Suction devices of course cause drag to initiate suction and such money is spent by boat manufacturers to design their boats for the least amount of drag. A safety factor is also to be considered by eliminating projections below the boat where there is a danger of being dislodged or knocked by objects in the water while the boat is in motion or by the force of waves striking against the underside of the boat while in motion or when it is beached and subjected to pounding surf.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof. For example, the shape of the various chambers and parts may be altered as understood by those in the art, and various means of fastening, such as threaded bolts and openings and welding or shrink fitting, etc., may be employed to connect the several parts together. Therefore, the invention is not limited by the form illustrated in the drawing and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. An automatic boat drain for installation in boats having a bottom hull and rear transom comprising in combination an automatic boat drain mechanism mounted against the rear outer face of the transom of a boat, said automatic boat drain mechanism being provided with a pipe extending through the transom, said pipe being connected by means of a flexible hose to a filtering agent for preventing foreign matter from fouling the automatic boat drain mechanism and having a screen, said filtering agent being supported with its screen in spaced relation to the interior bottom hull of the boat, said automatic boat drain mechanism being provided with a float-actuated valve.

2. An automatic boat drain for installation in boats having a bottom hull and rear transom comprising in combination an automatic draining mechanism and a filtering agent, said automatic draining mechanism having a laterally extending exhaust pipe and a laterally extending inlet pipe section provided for lateral insertion through the rear transom of a boat, there being a passage formed in said automatic draining mechanism to operatively connect said exhaust pipe with a lower chamber in said automatic draining mechanism, said passage being provided with an upwardly sloping valve seat extending thereacross, an upper chamber in said automatic draining mechanism operatively connected to said inlet pipe, at least one channel connecting said upper chamber with said upwardly sloping valve seat, a guide member axially disposed above said valve seat, a floatable valve slidably associated with said lower chamber, valve seat and guide member, said floatable valve being movable in said lower chamber relative to said valve seat such that water in said lower chamber will cause said valve to sealingly engage with said valve seat and prevent passage of water upwardly into said channel.

3. The automatic boat drain of claim 2 wherein said exhaust pipe is adapted to receive a removable safety plug.

4. The automatic boat drain of claim 2 wherein the upper chamber of the automatic draining mechanism is adapted to receive a removable safety plug.

5. The automatic boat drain of claim 2 wherein the valve is provided with an upwardly sloping portion to mate with said upwardly sloping valve seat.

6. The automatic boat drain of claim 5 wherein a buoyant material is securably fastened to said valve in

operative engagement with said upwardly sloping portion.

7. The automatic boat drain of claim 2 wherein the automatic drain mechanism is securably fastened on the outside of the boat and the inlet pipe passes through a wall of the boat and is connected by means of a hose to the filtering agent disposed within the boat.

8. The automatic boat drain of claim 2 wherein the filtering agent is disposed below the level of water in the boat and is provided with a removably retained means for preventing foreign matter from fouling the valve seat of said automatic drain mechanism.

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