REMOTE CONTROL DRAIN VALVE

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Field of Search 251/75, 82, 83, 147, 298-303, 251/294, 41, 94, 99; 137/535, 614; 220/24, 25; 128/349 R

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ABSTRACT

The drain valve has a tubular valve seat member extending into a drain passage through a boat transom with neck and rim portions projecting from the transom. An elastomer valve ball is urged into seated engagement with the rim by a pair of elastomer arms extending in tension from the ball to a collar encircling the neck of the seat member to close the drain passage. A control cable connected to the ball is actuated from a remote forward position in the boat to pivot the ball on the rim between seated and un seated positions. An ear projecting from the ball along the rim provides a pivot and stop surface, and a tab projecting from the ball into the drain opening aids in the return of the ball to its seated position.

5 Claims, 4 Drawing Figures
REMOTE CONTROL DRAIN VALVE

This is a continuation, of application Ser. No. 456,536 filed Apr. 1, 1974, which was a continuation of Ser. No. 277,234, filed Aug. 2, 1972, both now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a drain valve for use in a boat or other suitable applications.

2. Description of the Prior Art

Drain valves which take advantage of the suction created at the stern of a moving boat to bail water from the boat are of two general types. In one type, a check valve permits water to flow through a drain passage from the inside of the boat when it is under way, but prevents water from entering the boat through such passage when the hydraulic pressure outside the boat is greater than that inside. However, such check valves operate automatically upon changes in pressure rather than selectively, and upon malfunctioning could permit water to enter the boat. A valve of this type is shown in U.S. Pat. No. 2,655,121.

The other type of drain valve employs a selectively removable plug to open and close a drain valve. A valve of this type is shown in U.S. Pat. No. 3,217,685. Obviously it is desirable to remove the plug only when the boat is under way. However, this is difficult to do if the operator is at the controls in a forward portion of the boat unless the plug can be removed from and inserted into the drain passage by remote control. Remotely operated valves of this type have been suggested, but these have employed complex mechanical or electro-mechanical linkages which are inherently expensive, difficult to install, and subject to malfunction. Moreover, electrically operated valves or other bailing devices present safety hazards where fuel fumes might exist.

Accordingly there is a need for a selectively operable drain valve for a boat that can be actuated surely, safely and simply by remote control.

SUMMARY OF THE INVENTION

According to the present invention the foregoing disadvantages of the prior art are overcome by providing a simple valve plug which rolls or pivots on the rim of the valve seat between open and closed positions under the influence of a simple push-pull control cable connected directly to the valve plug. Resilient arm means continuously urge the plug against the rim to maintain the plug in either its unseated or seated position as determined by the control cable. A first shoulder-defining portion of the plug extending along the rim within the drain opening serves as a claw to aid the plug in its return to its seated position. A second shoulder-defining portion provides a pivot surface for rolling the plug on the rim and limits outward rolling movement of the plug from its seated position.

The principal object of the invention is to provide a selectively operable drain valve that can be opened and closed simply and surely by remote control.

Other features of the invention include its low cost, ease of installation, minimum number of parts, and relatively foolproof, safe operation.

The foregoing and other objects, features and advantages of the present invention will become more apparent from the following detailed description, which proceeds with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a boat incorporating a drain valve in accordance with the invention; FIG. 2 is an enlarged fragmentary section through a portion of the transom containing the drain passage and valve in the boat of FIG. 1; FIG. 3 is an axial sectional view of the drain valve taken along the line 3--3 of FIG. 2, showing the valve in its closed position; and FIG. 4 is a view similar to that of FIG. 3 showing the valve in its open position.

DETAILED DESCRIPTION

With reference to the drawing, FIG. 1 shows a boat having a hull 10 including a transom 12 provided with a drain opening at 14. The opening is fitted with a drain valve indicated generally at 16. The valve is selectively and remotely actuated by operating means including a conventional sheathed push-pull control cable 18. The cable extends along one side of the boat forwardly from the valve to a control handle 20 at a forward point in the boat near where the boat operator would normally position himself.

Referring to FIGS. 2 and 3, drain passage 14 through transom 12 is lined with a thin plastic or metal sleeve fitting 22. A ratchet-ribbed adapter portion 24 of a tubular valve seat member 26 is inserted within the drain passage 14 with its ribs in snug engagement with sleeve 22. The seat member includes a neck portion 28 projecting inwardly of the boat from the transom and terminating at an annular rim 30. The outer end of the rim defines a seat 31 for a valve plug member 32. The neck 28 and rim 30 form an extension of drain passage 14 which is closed by plug 32 when the latter is fully seated against rim seat portion 31.

Valve plug member 32 is a generally spherical elastomer ball sized so as to seal drain passage 14 closed when seated. Resilient means comprising a pair of elastomer arms 34 molded integral with the valve ball extend from outer opposite sides of the valve ball to an integral elastomer collar 36 which encircles and grips neck portion 28 of the seat member. The arms are in tension when collar 36 is on neck 28 and the valve ball is on the rim, thus normally urging the ball into seated engagement with the rim.

Means are provided for pivoting or rolling plug 32 on the outer end of rim 30 from its seated, closed position shown in FIG. 3 to its unseated, open position shown in FIG. 4. Such operating means includes the sheathed push-pull cable 18, one end of which is connected to control handle 20, and the other end 18a of which is connected directly to plug 32. For this purpose the plug includes a pair of clevis plates 38 molded into the elastomer ball. Portions of the clevis plates extend from an outer portion of the ball and pivotally mount a clevis pin 40. The pin projects from opposite sides of a cable connector block 42 between the clevis plates. This block has a through opening which receives the end 18a of the control cable. A set screw 44 secures the cable end within the block. The clevis plates are held firmly within the ball by elastomer ball material which fills a series of holes 56 in the clevis plate portions buried within the ball. The portions of clevis pin 40 that extend through pin holes in the clevis plates are preferably of much smaller diameter than such holes to facili-
tate proper adjustment of the control cable. The pin can be inserted through such holes simply by spreading and then releasing the clevis plates, which is permitted by the elastomer composition of the ball. The outer ends of the pin may be expanded to diameters larger than the pin holes by swaging or crimping following installation to prevent removal of the pin from the plates in use.

A cable bracket plate 46 forms part of the valve assembly and includes a portion 46a encircling the seat member 26 below a retainer flange 48 of such member. An offset, angular portion 46b of the bracket includes a cable sheath-gripping portion 50 which maintains the sheath of the control cable in a stationary position. The bracket plate is not fastened to the transom, but instead is permitted to swivel freely about seat member 26 between its flange 48 and a lip of the sleeve fitting 22. The seat member, in turn, is held securely to the transom by its ratchet-ribbed adapter portion 24. Because of the free swiveling nature of the cable bracket, the control cable becomes aligned with the valve ball for proper operation automatically when the sheath of the cable is secured to the bracket and the cable end is attached to clevis block 42, thereby greatly simplifying installation and adjustment of the cable and valve assembly.

As shown clearly in FIGS. 3 and 4, the elastomer ball portion of plug 32 includes a tab or claw portion 52 which, when the plug is seated on the rim, extends downwardly within the drain opening. In this position a shoulder portion 52a of the tab extends along an inside wall of the rim. Shoulder 52a serves as a claw to help return the ball from its unseated position of FIG. 4 to its seated position of FIG. 3 when the cable is pushed.

The ball also includes an ear portion 54 defining a shoulder 54a which extends along the outer end of rim 30 and beyond when the ball is seated. Ear 54 helps maintain the clevis plates 38 in spaced-apart relationship and provides additional contact surface area between the elastomer ball material and the clevis plate to provide a more secure interconnection between the two materials. Shoulder 54a of the ear provides a pivot or rolling surface in contact with the outer end of rim 30 to enhance the rolling action of the ball when the cable is pushed or pulled to seat or unseat the ball. In this sense, the rim serves as a fulcrum against which the ear portion of the ball pivots as a lever in unseating and seating the ball. Shoulder 54a also limits the outward pivoting or rolling movement of the ball on the rim because such shoulder will rotate into abutment with an outer side surface of the rim if the cable is pulled to excess.

OPERATION

In operation the boat operator, seated near the cable control 20, moves the control forward to pull the cable upwardly in FIG. 3 while the boat is traveling at high speed in a forward direction. When this happens the upward force exerted by cable end 18a at the outer end of the cable and the force of plug 32 creates an unbalancing force on the plug, causing it to roll outwardly from its seated position of FIG. 3 over an outer end of the rim to the unseated position shown in FIG. 4. In the ball's unseated position shown, elastomer arms 34 interconnecting the ball and collar 36 are not quite in an over center position with respect to the center of the ball. Therefore, the operator must maintain a pulling force with the cable to keep the valve open. If the operator releases the cable, or if the cable should break, the arm 34 will return the ball to its seated position. However, if the ball is pivoted to its maximum unseated position wherein shoulder 54a abuts the outer side surface of rim 30, arms 34 shift to a slightly over-center position and will hold the ball in an unseated position against the rim without the operator having to continue to apply pulling force with the cable. Under this condition the operator returns ball 32 to its seated position simply by moving the cable control 20 rearwardly, causing cable end 18a to apply a pushing force to the clevis connection of the plug. When this occurs the ball begins to roll back toward its seated position and elastomer arms 34 shift back from their over-center positions and thus urge the ball seal back into full seated engagement with the rim to reclose the drain passage.

Whether the arms or the cable initiate return of the ball to its seated position, the ball is aided in this return movement by the claw action of shoulder 52a of tab 52 acting against the inner edge of rim 30. The extent to which ball 32 is unseated and thus whether or not arms 34 shift to an over-center position when the control cable is pulled can be controlled by adjusting the distance between the valve end of the sheath of cable 18 and the clevis plates. By positioning the sheath end close to such plates, the valve will be self-closing. When this distance is increased to a point permitting the valve ball to be rolled to its maximum unseated position, closing of the valve must be initiated by the cable.

Having illustrated and described what is presently a preferred embodiment of the invention, it should be apparent to persons skilled in the art that the same permits of modification in arrangement and detail. I claim as my invention all such modifications as come within the true spirit and scope of the following claims.

I claim:

1. A drain valve comprising:
   means defining a valve seat including a rim surrounding a drain passage,
   a movable valve plug adapted for seated engagement with said rim to close said passage, and
   plug-operating means selectively operable to roll said plug on said rim into and out of seated engagement to open and close said drain passage,
   said valve seat including a tubular valve seat member defining an extension of said drain passage, said member including said rim and a neck portion axially inwardly of said rim, and resilient means interconnecting said plug and said neck portion in a manner urging said plug into engagement with said rim,
   said valve plug comprising a generally spherical resilient elastomeric valve ball, said resilient means comprising a pair of resilient elastomeric arms extending from opposite sides of said ball to an elastomeric collar, said collar encircling said neck portion of said seat member at a position spaced axially inwardly from said rim so that said arms urge said ball into seated engagement with said rim to seal said passage,
   said arms, collar and ball being integral with one another and said arms being connected to upper central portions of said ball so as to bias said ball both in a seated position and in an unseated over-center position upon movement of said ball to said positions by said operating means,
   said valve ball having a projecting claw portion extending along an inner wall of said drain passage.
3,927,860

and a projecting ear portion extending over an outer surface of said rim when said ball is seated on said rim, said claw and ear portions together projecting from a common quadrant of said ball and being positioned to act against a common sector of said rim, said claw and ear portions having intersecting shoulders for facilitating the pivoting of said ball between predetermined seated and unseated positions on said rim upon actuation of said operating means.

2. A valve according to claim 1 including a pair of rigid parallel and closely spaced-apart clevis plates molded into said elastomeric valve ball with portions of said plates projecting from said ball, a clevis pin extending between said projecting plate portions, and cable connector means carried by said pin, said plug-operating means including a push-pull actuator cable connected to said cable connector means.

3. A valve according to claim 2 wherein said extending portions of said clevis plates are normally urged into a predetermined spaced relationship by the resiliency of said elastomeric valve ball to retain said clevis pin between said plates, said resiliency enabling the temporary separation of said clevis plates under an external separating force to permit installation of the opposite ends of said clevis pin through said plates.

4. A drain valve comprising:
means defining a valve seat including a rim surrounding a drain passage,
a movable valve plug means adapted for seated engagement with said rim to close said passage,
and plug-operating means selectively operable to roll said plug means on said rim into and out of seated engagement to open and close said drain passage, said means defining a valve seat including a tubular valve seat member having an adapter portion extending in a force fit within said drain passage to secure said seat member to a body defining said drain opening, and a neck portion extending axially outwardly of said passage between said rim and said adapter portion, said plug-operating means including a control cable means connected to said plug means, and cable-mounting means extending in surrounding relationship to said neck portion for swiveling movement about said seat member to enable proper operating alignment of said cable means with said plug means.

5. A valve according to claim 4 wherein said adapter portion includes a ratchet-ribbed external surface for resisting withdrawal of said seat member from said drain passage, a tubular liner fitting for lining the wall of said drain passage and including an annular lip at one end thereof for surrounding a surface opening of said drain passage, said ratchet ribbed surface of said adapter portion engaging the inside surface of said liner, said neck portion including an annular flange spaced axially from said annular lip, said cable mounting means including a plate portion surrounding said neck portion between said lip and said flange and extending radially from said neck portion.

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