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Rogers et al.

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[54] **SELF-CONTAINED DRAIN VALVE**

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[52] **U.S. Cl.** **4/287**

[51] **Int. Cl.** **A47k 1/14,** E03c 1/26

[58] **Field of Search** 4/286, 287, 295; 251/263

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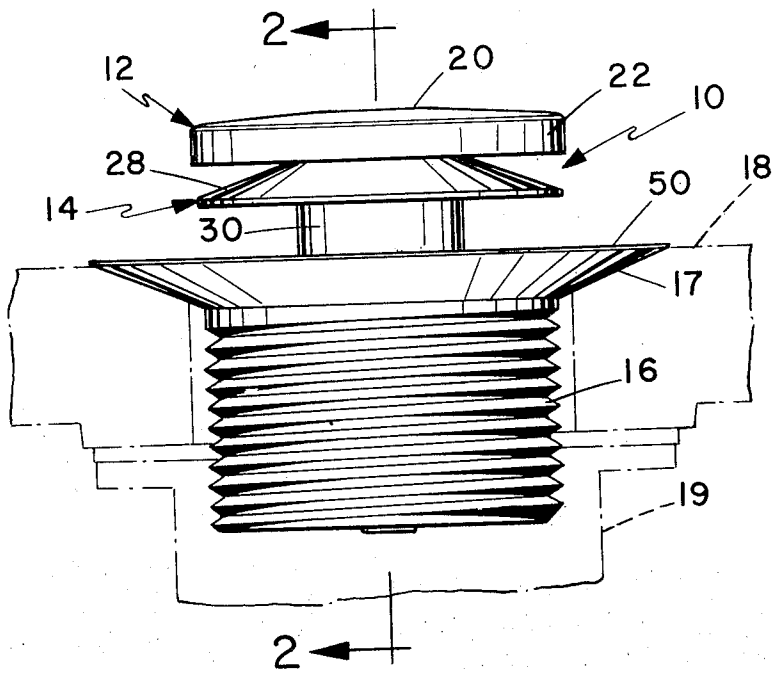
Primary Examiner—Henry K. Artis

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[57] **ABSTRACT**

A drain valve for sealing a conduit comprising a resilient boot including a sealing surface for biasing an actuator and the sealing surface away from a second sealing surface. The actuator is held in a sealing position by a latch and is released by disengaging pressure on the actuator releasing the latch and allowing the resilient boot to return the actuator to its non-sealing position.

11 Claims, 6 Drawing Figures



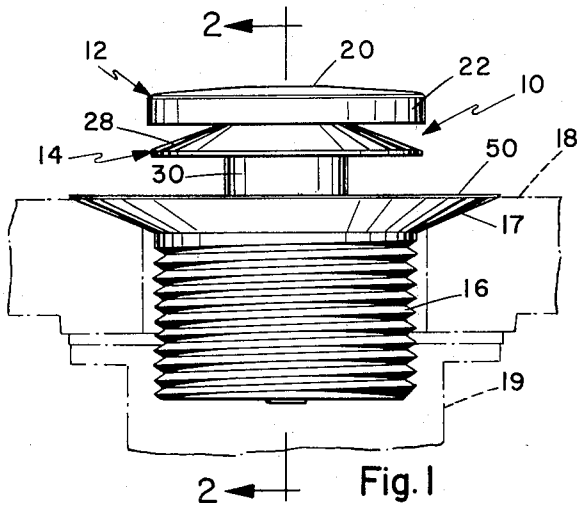


Fig. 1

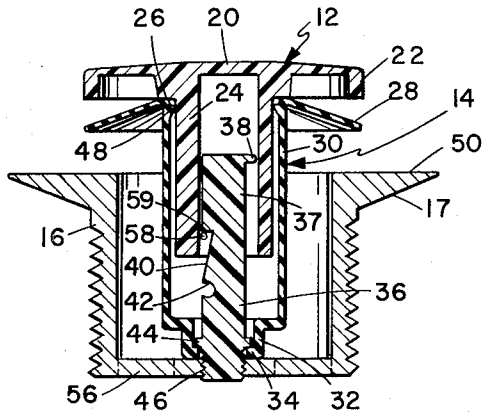


Fig. 2

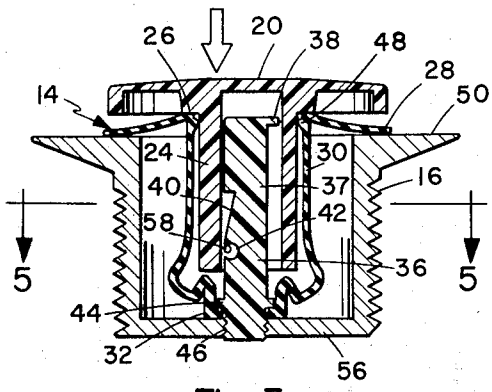


Fig. 3

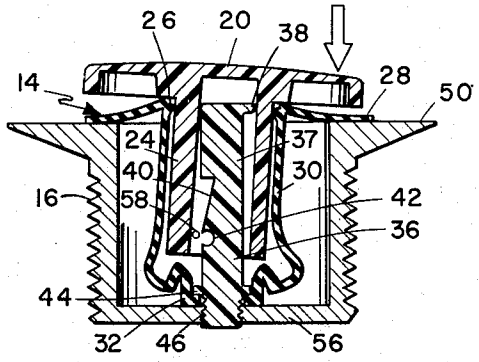


Fig. 4

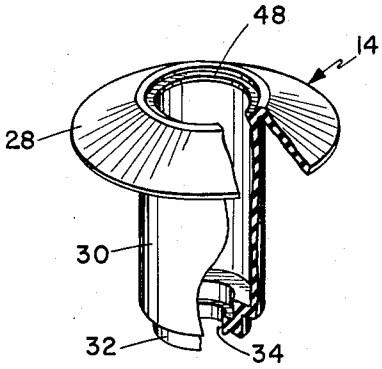


Fig. 6

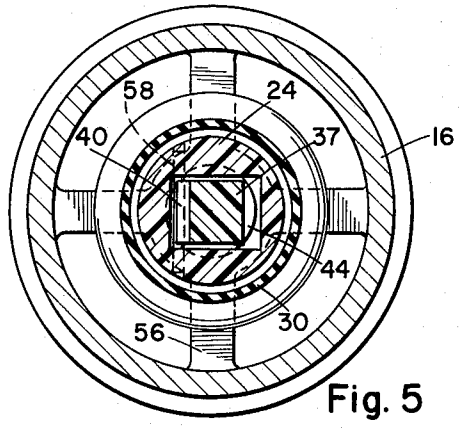


Fig. 5

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SELF-CONTAINED DRAIN VALVE

BACKGROUND OF THE INVENTION

Drains for household use in sinks, bathtubs and the like have been a continual source of operational and maintenance problems over the years. These drains frequently become inoperative after a short period of use, because of the complexity of the apparatus utilized or the inherent functional deficiencies of that apparatus.

Those drains utilizing a lever-operated remote actuator valve that is located for example, on the wall of the bathtub area often experience frequent difficulty with the actuating mechanism. Further these remote drain actuators must, of necessity, have a linkage that travels below the bathtub or sink making them difficult to install and inaccessible to repair in many installations. These lever-operated, remote, actuator drain valves as well as other known drain valves also frequently do not provide for an effective seal, often allow leakage of the water out of the tub and require continual re-filling to maintain a given level.

Because of the aformentioned defects in prior art bathtub drain valves, drain valves have been developed that are actuated at the location of the valve itself. In these drain valves, the housing contains the actuating mechanism as well as the sealing mechanism. One such type of drain valve has an actuating mechanism that operates on a principle similar to that utilized in ball point pens, for alternately extending and retracting the valve sealing mechanism. These valves employ a number of moving parts that are subject to wear, breakage and other failures. In addition, these valves require considerable downward travel beyond the sealed position in order to release the drain from its down position. This requirement for downward travel prior to release, compounds the sealing problems associated with this type of drain valve.

Because of the aforementioned deficiencies in prior art drain valves, there is a need for a drain valve that is self-contained, to eliminate the problems of remote actuation, but which contains an improved and simplified actuation mechanism and seal, to overcome the deficiencies of the prior art self-contained drain valves.

SUMMARY OF THE INVENTION

An exemplary embodiment of the invention provides a simplified and efficient self-contained drain valve that requires few moving parts and protects those parts against wear contact and fouling, while providing a good seal against leakage of the water from the tube or basin into the drain conduit.

The exemplary embodiment of the invention employs a resilient means or boot that performs plural functions. The boot carries an integral sealing surface or skirt and has secondary seals for preventing the entrance of water into the interior of the valve latch mechanism. A latching means or guide pin is secured to the structure of the bathtub or conduit and therefore is immovable with respect to that structure. The latching means contains a latching section that cooperates with a corresponding actuator latching means on an actuator to hold the actuator and the sealing skirt in its sealing or down position. In the instant embodiment this latching function is accomplished by a protrusion in the form of a pin on the actuator. A sloping ramp opening on the guide pin guides the protrusion into a latching notch and the upward limit of the actuator's movement is determined by the terminal portion of the ramp opening. The resilient means seals around the upper circumference on the actuator and at the lower circumference of the guide pin, to prevent the entry of water into the mechanism. The sealing surface or skirt of the resilient means extends radially outward from the cylindrical portion and is pressed into the sealing contact position with a second sealing surface. The second sealing surface may be a flat upper surface of the spud or drain housing.

In operation, if it is desired to fill the tub or basin, the operator depresses the actuator by contact, either with the central portion of the actuator or with the peripheral portion which would tend to cock the actuator in a direction to force the protrusion or pin toward the central portion of the apparatus. By this combined compressing and cocking action, the latching means, comprising the pin on the actuator, will be forced up the ramp into the latching depression. Therefore, the actuator will be held in a depressed position. The depressed position of the actuator forces the sealing flange or surface of the resilient means into contact with the sealing surface on the spud, for example. Since the resilient means is flexible, this causes a sealing bias against the sealing surface and ensures that no water will pass the sealing surface and enter the conduit. After the water in the basin has been utilized, and it is desired to allow it to drain through the drain valve and into the conduit, the operator need only press the appropriate portion of the actuator and the mechanism will function to open the valve for draining. The appropriate portion of the actuator for opening the valve is that portion that will cause the actuator to cock or tilt the protrusion away from the central portion of the guide pin and out of the latching notch. This action requires only a very slight downward movement of the rim of the actuator, and after the pin clears the notch, the upward bias, caused by the resilient means, returns the actuator to its upward position. The bias caused by the resilient means is created by a bulged or rolled section of the resilient means near its lower end.

It is therefore an object of this invention to provide a new and improved self-contained drain valve.

It is another object of this invention to provide a new and improved self-contained drain valve that utilizes few moving parts.

It is another object of this invention to provide a new and improved self-contained drain valve which incorporates a resilient element that may be easily replaced.

It is another object of this invention to provide a new and improved self-contained drain valve in which the resilient element utilized also serves a sealing function.

It is another object of this invention to provide a new and improved self-contained drain valve that has a long useful life.

It is another object of this invention to provide a new and improved self-contained drain valve that is easily operated.

It is another object of this invention to provide a new and improved self-contained drain valve that provides a good seal against flow of water through a conduit.

It is another object of this invention to provide a new and improved self-contained drain valve that is sealed against the entrance of water to its inner workings.

It is another object of this invention to provide a new and improved self-contained drain valve that is low in cost and easy to manufacture.

Other objects and many advantages of this invention will become more apparent upon a reading of the following detailed description and an examination of the drawings, wherein like reference numerals designate like parts throughout and in which:

FIG. 1 is a side elevation view of the drain valve in open position.

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1.

FIg. 3 is a similar sectional view, but with the drain valve in the closed position.

FIG. 4 is a similar sectional view indicating the release action.

FIG. 5 is an enlarged sectional view taken on line 5—5 of FIG. 3.

FIG. 6 is a perspective view, partly cut away, of the resilient boot element.

Referring now to the drawings, there is illustrated an embodiment of a drain valve **10** of the invention. The drain valve **10** comprises an actuator **12** mounted within a resilient means or boot element **14** and received on a latching means or guide pin **36.** The guide pin **36** is secured to the spud or drain housing **16** and has a lower sealing and holding ring **44.** The spud **16** having a spider position **56** is positioned in the drain of a bathtub **18** or other fixture and communicates with drain conduit **19.** A seal portion **17** of spud **16** seals against the drain opening in the bathtub.

The actuator **12** comprises a substantially flat upper portion **20,** having a depending flange **22** at the outer circumference thereof. There is a depending tubular projection **24,** extending from the upper portion **20,** that has mounted thereon or secured thereto, a latching protrusion or pin **58.** The actuator is sized to fit within the cylindrical tubular section **30** of the resilient boot **14** and has a shoulder **26** that abuts the upper surface of resilient boot **14** in sealing engagement. The upper end of tubular section **30** has an internal annular rib **48** to grip tubular projection **24.**

The resilient means or boot **14** has a circumferentially, radially extending, flexible, sealing skirt **28** that projects radially beyond the opening in the spud **16** or other mounting portion of the conduit, to contact a sealing surface **50.** The lower terminal portion of the resilient boot **14** includes a necked down cylindrical section **32** with an inwardly, radially, extending flange **34** that fits against the threads of guide pin **36.** The guide pin is threadably received in a hole **46** in the spider portion **56** of the spud and draws ring **44** toward spider **54** to grip flange **34** therebetween forming a seal while holding the boot **14** in position.

The guide pin **36** comprises a generally elongated body **37** having at its upper end a pivot protrusion **38** that acts as a pivot during the operation of the drain valve as will be described hereinafter. Intermediate its ends, the guide pin **36** has a latching section that includes a stop ramp opening **40** in the elongated body **37** that terminates adjacent a latching notch **42.** The latching notch **42** is sized to accommodate the latching pin or protrusion **58** mounted on the actuator.

FIG. 2 illustrates the drain valve of the invention in its fully extended, open position. The resilient boot holds the actuator **12** against the stop **59** at the top of ramp opening **40,** and sufficient clearance is provided between the lower edge of the flexible sealing skirt **28** and the upper surface **50** of the drain housing to allow free flow of the water past the valve and into the conduit **19.**

FIG. 3 illustrates the sealing position assumed by the valve **10** during and after the depression of the actuator **12,** that latches the valve **10** in its sealed position. The arrow indicates the portion of the actuator surface **20** that is depressed to achieve the latching action. The pivot protrusion **38** in one dimension and the walls of the cavity within the actuator **12** act as a guide for the tubular projection or guide member **24** and prevents excessive cocking, tilting or rotation of the actuator during the depression operation. The arrow indicates that the actuator pin **36** would have a bias toward the center of the valve during depression and therefore would ride up a portion of the ramp before dropping into the latching notch **42.** FIG. **3** also illustrates the rolling bulging action of the tubular section of the resilient means or boot **14** in producing a resilient upward bias and accommodating the downward movement.

FIG. **4** illustrates the action associated with the release of the drain valve from its down and sealed position. The arrow indicates the point at which pressure is applied to effect the release of the actuator **12.** As illustrated, the pressure at the point indicated by the arrow causes a cocking or tilting of the actuator **12** with respect to the rigidly held pin **36** and this cocking or tilting causes the pivoting of the actuator **12** about the pivot protrusion **38** and the exit of the latching protrusion **58** from the latching notch **42.**

When the latching protrusion **58** is clear of the latching notch **42,** the actuator **12** and resilient means **14** are free to move upward and the resilient means **14** biases the actuator **12** and the sealing skirt **28,** in an upward direction until it assumes the position previously described with reference to FIG. **2.** Only a very slight depression of the actuator **12** is necessary to accomplish release.

Having described our invention, we now claim:

1. A drain valve for selectively sealing a conduit comprising:

a first sealing surface,

resilient means comprising a tubular portion surrounding latching means for biasing an actuator means and a second sealing surface away from said first sealing surface,

said latching means for releasably latching and holding said actuator means against the bias of said resilient means and holding said first and second sealing surfaces in contact, and

said actuator means having means for transmitting force to latch and unlatch said latching means.

2. The valve of claim **1** wherein,

said second sealing surface comprises a portion of said resilient means.

3. The valve of claim **1** wherein,

said tubular portion comprises a thin walled cylindrical means for bulging adjacent its lower end to accommodate movement of said actuator and to produce a return bias.

4. The valve of claim **1** wherein,

said second sealing surface comprises a circumferential radially extending skirt of flexible material.

5. The valve of claim **1** further including,

a conduit,

said latching means being secured within said conduit,

and said first and second sealing surfaces comprising conduit seal means for preventing the flow of fluid through said conduit.

6. The valve of claim **1** wherein,

said latching means comprises an elongated guide pin having a latching section spaced from a first end thereof,

said actuator means having a tubular extension received within said tubular portion of said resilient means,

and said tubular extension having a guide pin receiving bore and an actuator mounted latching means for cooperating with said latching section of said guide pin to hold said actuator in a sealing position.

7. The valve of claim **6** wherein,

said latching means comprises a protruding element within said tubular extension,

and said latching section comprises means for receiving said protruding element.

8. The valve of claim **7** wherein,

said bore is substantially larger than said guide pin in at least one cross sectional dimension.

9. The valve of claim **7** wherein,

said guide is constrained by the walls of said bore against relative rotation about the long axis of said bore.

10. The valve of claim **7** wherein,

said guide pin includes a ramp means intermediate said latching section and said section end of said guide pin for guiding said protruding element toward said means for receiving said protruding element,

and said guide pin having a pivot protrusion means adjacent said second end for providing a pivot point for said actuator.

11. An article for use in a valve comprising,

a unitary piece of thin walled resilient material having a tubular section,

said tubular section terminating at its upper end in an upper sealing means for sealing against a valve actuator, and at its lower end in a lower sealing means for sealing against a latching means,

and said unitary piece also including a circumferential radially extending flexible skirt adjacent said upper end of said tubular section.

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