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(54) Title: DRAIN VALVE ASSEMBLY

(57) Abstract: A drain valve assembly having a stem which can be inserted into a crankcase or other fluid reservoir, wherein the stem is connected to a housing which encloses a sealing barrel movably secured and sealed in the connected stem and housing, and wherein the sealing barrel can be manipulated in a single direction from the exterior of the assembly to open or close a fluid passage through the assembly. An end cap may also be provided tethered to the housing for sealing off the fluid passage. Selected movement of the sealing barrel in the connected stem and housing may also be used to control the volume and flow of fluid through the fluid passage.



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KNOW ALL MEN BY THESE PRESENT:

That the undersigned, SAM JANG, whose citizenship and residency is set out in the
Declaration forming a part of this document, has invented a certain new and useful improvement
in a

DRAIN VALVE ASSEMBLY,

for which the following constitutes his application for United States Letters Patent, describing
and claiming the said invention as follows:

DRAIN VALVE ASSEMBLY

1
2 **1.** Priority in this application is based upon a Provisional Patent Application filed October 26,
3 2004, identified as US SN 60/622,465.

4 **2.** This invention related to a drain valve assembly for withdrawing fluid from a reservoir and
5 is particularly concerned with draining fluid from a crankcase or the like, particularly in small
6 engines like those found in lawn and garden tractors, small gasoline appliances, and the like.

Background and Summary of the Invention

7
8 **3.** Draining the crankcase of a small engine is frequently done by a home owner and not by a
9 trained mechanic, and that process is often a messy job. Conventionally, this job is done by
10 unscrewing a draincock or plug at the lowest point of the crankcase or fluid reservoir. The
11 unscrewing of the drain plug is frequently associated with a spill of the oil or other liquid.
12 Oftentimes, the drain will begin to leak before the plug is fully opened, and turning it one way or the
13 other will cause the draining to cease or create a steadier uncontrolled flow. Obviously, uncontrolled
14 spills are not only messy, but are adverse to the environment and sometimes dangerous, as the fluid
15 tends to soak into whatever surface it drains to, is often difficult to clear or clean and is some times
16 combustible.

17 **4.** In the past, many inventors have sought to deal with these problem by designing special drain
18 valves. Examples of such devices include those structures found in:

19 Chen Pat. No. 6,609,699, OIL DRAIN VALVE;

20 Wickett Pat. No. 6,113,072, ACCESS PORT OR DRAIN PLUG WITH
21 VALVE FOR LIQUID CONTAINERS;

22 Conklin et al Pat. No. 5,908,086, QUICK DRAIN CRANKCASE DRAIN

1 PLUG;

2 Shropshire et al Pat. No. 5,411,115, OIL DRAIN PLUG;

3 Lombardo Pat. No. 5,407,117, OIL VALVE DEVICES FOR REMOVING USED

4 OIL FROM DRAIN PANS OF VEHICLES;

5 Burdick et al Pat. No. 5,096,158, OIL DRAIN VALVE ASSEMBLY;

6 Martz Pat. No. 4.807.847. VALVED OIL PAN PLUG;

7 These designs usually involved critical trigger arrangements for opening and closing the flow of fluid
8 or devices such as balls or cams which could interfere with the smooth flow of fluid (particularly
9 where the fluid contains solids or is pasty) or twisting of the drain plug upon weak parts of the
10 assembly or diverting the flow from a straight gravity flow which interfered with the draining of
11 semi-viscous fluids, like some spent heavy oils. All of these systems are believed to require
12 relatively difficult designs or not suitable or versatile enough for most types of simple drain
13 application or involve risk of leaks or handling of messy parts or dangerous materials to accomplish
14 the fluid draining job.

15 5. In the present invention, the drain valve assembly has a stem which may be threaded or
16 otherwise inserted into the housing of an oil pan, preferably at the lowest point thereof, for smooth
17 gravity flow from the fluid reservoir. This stem receives one end of a novel sealing barrel seated
18 therein and extending downwardly therefrom, and arranged over the other end of the barrel is an
19 outside housing. In the stem and housing there is an o-ring which seals the barrel into the stem and
20 outside housing. At the free end of the outside housing, there may be a safety end cap tethered to
21 the housing and free to be moved on to and off the free end of the barrel. Extending from the barrel
22 in the direction of flow are integral tabs which may be pinched together to free the barrel for vertical

1 movement so that the barrel may be pulled downwardly to open a channel through the barrel and
2 allow the fluid to flow from the fluid reservoir, or when opened, to be lifted for closing the channel.
3 With this arrangement, the valve or barrel is opened or closed merely by moving it upwardly or
4 downwardly, without any twisting or switching of a valve relatively to the direction of flow, and
5 further, only the outside of the barrel is manipulated, so that the user does not come into contact
6 with any surface touching the fluid. The barrel may be rotated horizontally so the it is accessible
7 from any degree on its circumference.

8 **Objects and Advantages of the Invention**

9 6. It is the object of the present invention to provide a novel drain valve assembly of the
10 character recited.

11 7. Another object is to provide a novel sealing barrel for a drain valve assembly.

12 8. Another object is to provide a novel drain valve which can be opened or close by moving a
13 sealing barrel only in the direction of flow.

14 9. Another object is to provide a novel drain valve which can be opened and closed from the
15 exterior of the valve assembly without contacting parts of the assembly coming in contact with the
16 fluid being drained.

17 10. Another object is to provide novel opening-closing mechanism for a drain valve assembly
18 which can be manipulated from members formed integrally with a drain valve sealing barrel.

19 11. Another object is to provide a drain valve assembly which can be fabricated from a few parts.

20 12. Another object is to provide a drain valve barrel which can be horizontally rotated to any
21 degree position in the circumference of a circle so that its opening tabs may be manipulated
22 irrespective of its orientation in the stem and housing.

13. Another object is to provide a drain valve assembly which is easy and inexpensive to fabricate and simple and efficient to use.

14. These and other objects and advantages of the invention will become more apparent as this description proceeds, taken in conjunction with the appended drawings and claims.

Brief Description of the Drawings

15. In the drawings:

16. Figure 1 is a perspective view of a drain valve assembly embodying the invention.

17. Figure 2 is an isometric view of the drain valve assembly shown in Figure 1, with some of the individual parts of the assembly shown exploded from one another.

18. Figure 3 is a view showing the sealing barrel of the drain valve assembly arranged against the stem in normally closed position (the safety end cap and tether are not shown).

19. Figure 4 is a view showing the sealing barrel of the drain valve assembly arranged spaced away from the lower part of the stem in valve open position (the safety end cap and tether are not shown).

Description of a Preferred Embodiment

20. With reference to the accompanying drawings, a typical drain valve assembly embodying the present invention comprises a stem 10, which may have a threaded end 11 adapted for insertion in the crankcase of an engine (not shown). The other end of the stem 10 remote from the threaded end 11 comprises a sleeve 12, and this entire stem has an axial passage 13 which permits the flow of fluid therethrough. This sleeve 12 has on opposed exterior sides thereof at least two ribs 14 extending therefrom. One end of a sealing barrel 15 is positioned in the sleeve 12, and the other end of the sealing barrel 15 extends through an outside housing 16. This outside housing 16 has an

1 interior diameter sized to overlay the sleeve 12 of the stem 10, and has apertures 17 which engage
2 the ribs 14 of the sleeve to hold the housing 16 and stem together overlaying the sealing barrel 15.
3 At the end 18 of the barrel 15 remote from the stem 15 a safety end cap 19 tethered to the housing
4 by a strap 20 is adapted to close a axial aperture 24 in the barrel 15 which is arranged in line to the
5 axial passage 13 in the stem 10.

6 **21.** O-rings 22 and 23 are provided on the sealing barrel 15 to seal the barrel in the stem 10 and
7 housing 16 and to prevent fluid flow or leakage at points other than through the drain valve in the
8 matter hereinafter described. Aperture 24 in the barrel 15 is in flow communication with the
9 passage 13 and the channel 21 when the valve is open as hereafter described.

10 **22.** The barrel 15 has at its end adjacent the sleeve 12 of the stem 10 a plug 25 which is adapted
11 to enter the axial passage 13, which together with shoulder 26 on the barrel, blocks the flow of fluid
12 entering the stem passage when the barrel is in its home position as shown in Figure 3. When it is
13 desired to open the stem passage 13 and its corresponding fluid communication passage, aperture
14 24, the tabs 30 are pressed together to move the barrel 15 downwardly and open the flow passages,
15 as shown in Figure 4. Spaced apart on the tabs 30 are a pair of ribs 31 which define a recess 32 for
16 receiving a return 33 at the end of the housing 16, and when the tabs or pinched together, these ribs
17 and recess clear the return and permit the barrel 15 to move downwardly and open the passage, and
18 when the barrel is returned to closed position the ribs and recess snap engage the tabs 30 and hold
19 the barrel closed.

20 **23.** At the remote end of the barrel 15 on its outer circumference there are a series of ring like
21 undulations or barbs 35 which are adapted to engage the interior of the safety end cap 19. This end
22 cap 19 also has a lever 36 which may be manipulated when the end cap is installed over the barrel

1 axial aperture 24 to open the end of the fluid passage. The stem 10 may also have a multi-sided area
2 37 at the base of the threaded portion 11 which may receive a wrench to securely tighten the threaded
3 portion into a crankcase or similar fluid reservoir.

4 **24.** The barrel 15 is free to horizontally rotate to any degree in the circumference of a circle. This
5 feature makes it possible for a user to open or close the drain valve assembly from any reachable
6 position by merely pinching the tabs together and pulling the barrel to open position or pushing it
7 closed. The feature may also be important to original equipment manufacturers who can install a
8 more versatile drain valve assembly in their equipment without as much concern for other parts
9 which are near the desired drain valve location and which may block its efficient use.

10 **25.** From this disclosure, it is apparent that the improved drain valve assembly shown permits
11 fluid to flow merely by pulling the barrel 15 downwardly or to stop the flow of fluid by pushing the
12 barrel upwardly. No twisting of the barrel is required, although the barrel may be turned on its
13 horizontal axis and the barrel is still functional to move upwardly or downwardly as desired. The
14 surfaces upon which the barrel moves are relatively vertically long, so that the barrel is constantly
15 supported and the flow is open, even if the fluid contains "gunk" or other greasy based solids which
16 could interfere with the fluid flow if the direction of flow was interrupted. By use of the structure
17 taught herein, movement of the sealing barrel in the connected stem and housing may also be used
18 to control the volume and flow of fluid through the fluid passage.

19 **26.** While a preferred embodiment of the invention has been shown and described in considerable
20 detail, it should be understood that many changes can be made in the structure without departing
21 from the spirit or scope of the invention, and it is not desired that the invention should be limited to
22 the exact construction disclosed.

Claims

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- 3 **1. A valve assembly adapted for connection in a reservoir for gravity draining of fluid**
4 **therefrom, said valve assembly comprising**
- 5 **a hollow tubular stem having connecting means at its one end adapted for**
6 **insertion into said reservoir,**
- 7 **a housing secured to said stem, and**
- 8 **a sealing barrel in flow communication with and slidably secured in said stem**
9 **and housing,**
- 10 **said barrel having a sealing surface adapted to bear against said stem to**
11 **prevent gravity flow of fluid therethrough when in a first position,**
- 12 **said barrel having a second position moved away from said sealing**
13 **surface to open the gravity flow of fluid through said valve assembly,**
14 **said barrel being selectively opened or closed by moving said barrel**
15 **solely in the direction of flow of fluid from said reservoir.**
- 16
- 17 **2. In the drain valve assembly recited in Claim 1, wherein said barrel has tab means**
18 **extending from said housing adapted for grasping to move said barrel toward and**
19 **away from said sealing surface.**
- 20
- 21 **3. In the drain valve assembly recited in Claim 2, wherein said tab means comprise a tab**
22 **attached to said barrel and engagable to selectively move said barrel from a position**

1 toward or away from said sealing surface.

2
3 **4. In the drain valve assembly recited in Claim 3, wherein said tab means comprises a**
4 **flexible lever movable toward and away from said barrel.**

5
6 **5. In the drain valve assembly recited in Claim 4, wherein said tab means has lock means**
7 **for securing said barrel in closed position.**

8
9 **6. In the drain valve assembly recited in Claim 5, wherein said lock means comprises a**
10 **barb adapted to selectively engage said housing.**

11
12 **7. In the drain valve assembly recited in Claim 1, wherein said sealing surface is arranged**
13 **at one end of said barrel.**

14
15 **8. In the drain valve assembly recited in Claim 7, wherein said sealing surface has a plug**
16 **adapted to close said barrel against said stem.**

17
18 **9. In the drain valve assembly recited in Claim 7, wherein said sealing surface has an**
19 **annular shoulder adapted to bear against said stem.**

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21 **10. In the drain valve assembly recited in Claim 1, wherein said assembly includes an end**
22 **cap adaptable to close the end of said barrel remote from said stem.**

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11. In the drain valve assembly recited in Claim 10, wherein said barrel has circumferential undulations adapted to removably receive said end cap over said barrel end.

12. In the drain valve assembly recited in Claim 10, wherein said end cap is tethered to said housing.

13. In the drain valve assembly recited in Claim 1, wherein said assembly may be partially opened or closed by varying the movement of said barrel against said stem to enlarge or reduce said fluid flow.

14. In the drain valve assembly recited in Claim 1, wherein said connecting means comprises a threaded end on the surface of said stem for engagement in said fluid reservoir.

15. In the drain valve assembly recited in Claim 14, wherein the exterior of said stem has a flat surface adapted for engagement with a tool for inserting said stem into said reservoir

16. In the drain valve assembly recited in Claim 1, wherein said stem is secured to said housing over said barrel by cooperating rib and aperture means.

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- 3 **17. In the drain valve assembly recited in Claim 16, wherein said rib means extend from**
- 4 **said housing and said aperture means are arranged in said stem.**
- 5
- 6 **18. In the drain valve assembly recited in Claim 1, wherein said barrel is free to rotate in**
- 7 **a direction perpendicular to said direction of fluid flow.**
- 8
- 9 **19. In the drain valve assembly recited in Claim 18, wherein said barrel has tab means for**
- 10 **opening and closing a fluid flow passage in said assembly.**
- 11
- 12 **20. In the drain valve assembly recited in Claim 19, wherein said tab means may be**
- 13 **manipulated to open and close said fluid flow passage irrespective of the rotational**
- 14 **orientation of said barrel in said drain valve assembly.**
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