

[54] DRAIN PLUG ASSEMBLY

3,811,650 5/1974 Dehar 251/144

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[57] ABSTRACT

[21] Appl. No.: 469,692

The embodiment of the invention disclosed herein is directed to a drain plug assembly for insertion into the wall of a fluid container such as the radiator of an automobile. The drain plug assembly has a molded plastic body member which receives a molded plastic stem member and has an arrangement to provide an assembly which is inserted into an aperture formed in an embossment in the wall of the container and snap-locked in place. The body member of the drain plug has spaced apart walls which are urged toward one another during insertion of the drain plug assembly into the aperture of the container receiving the same. The spaced apart walls of the body member are maintained in an outwardly diverging configuration by a shoulder forming an annular abutment on the stem member when the stem member is threadedly tightened into the body member.

[52] U.S. Cl. 251/144; 251/217; 184/1.5

[51] Int. Cl.² B65D 41/04

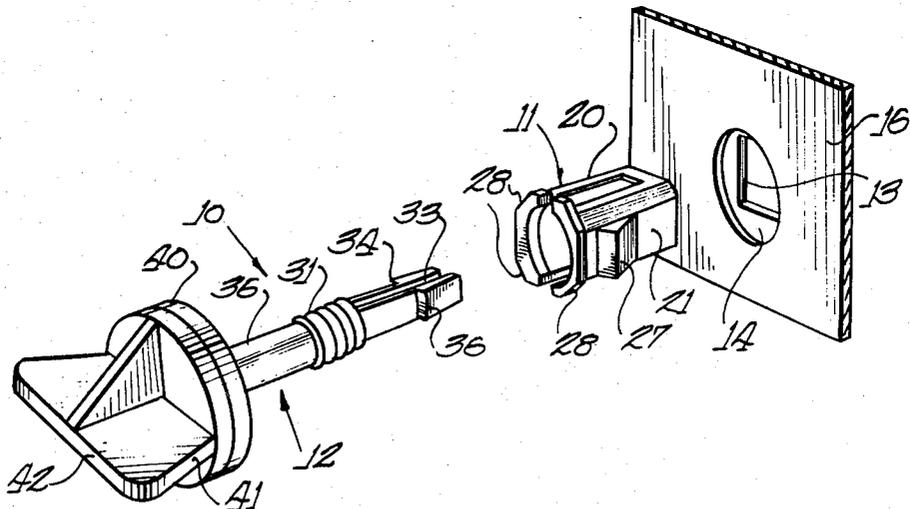
[58] Field of Search 251/144, 217; 285/194, 285/162; 220/38.5, 39 R, 288; 85/DIG. 2, 32 K, 32.1; 184/1.5; 137/351

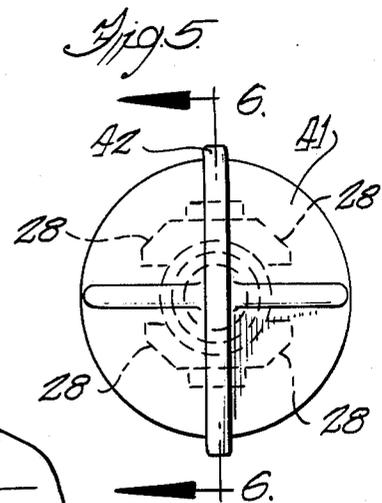
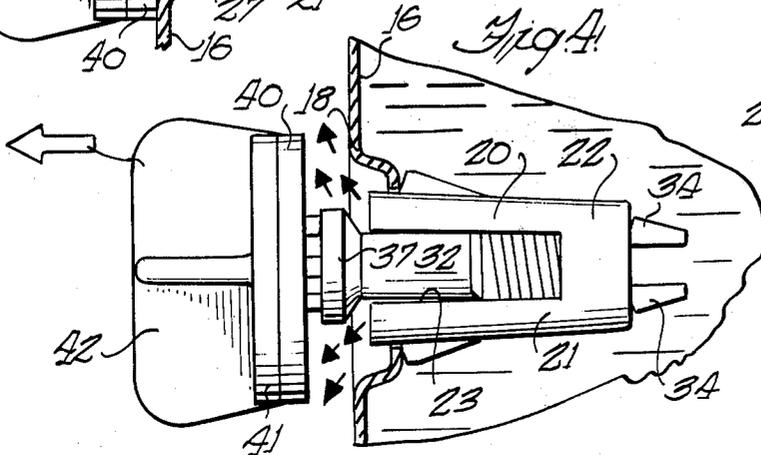
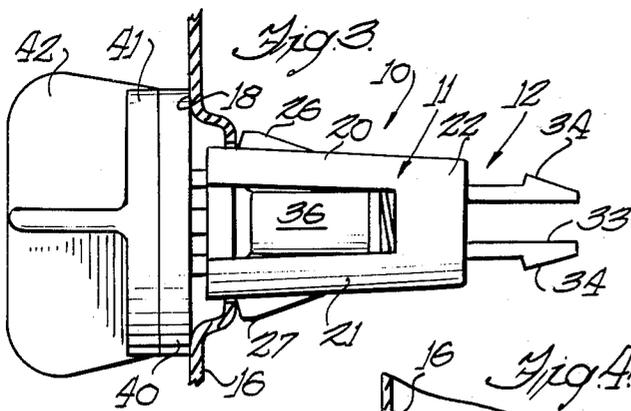
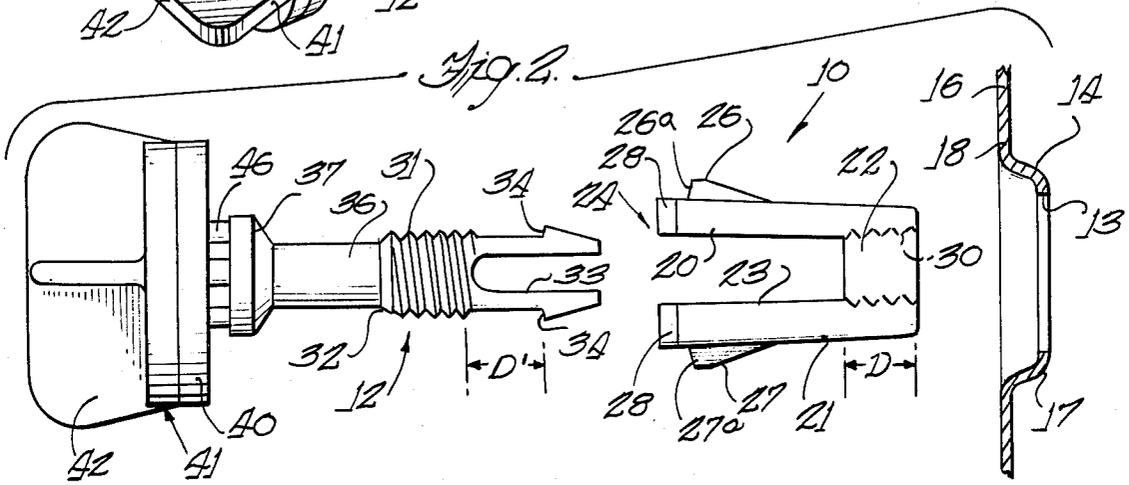
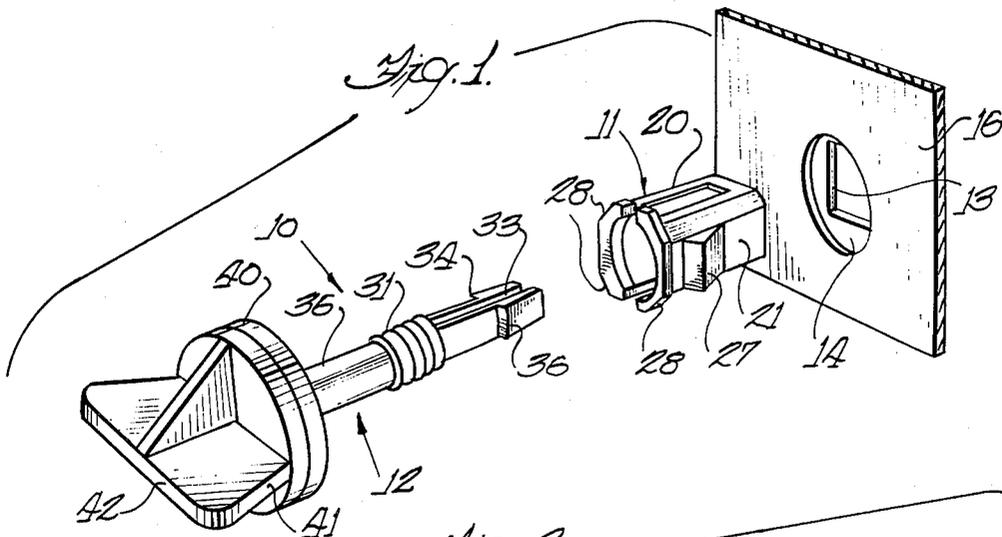
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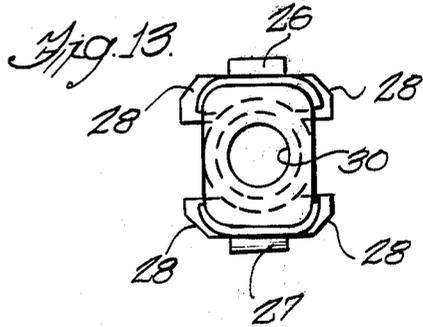
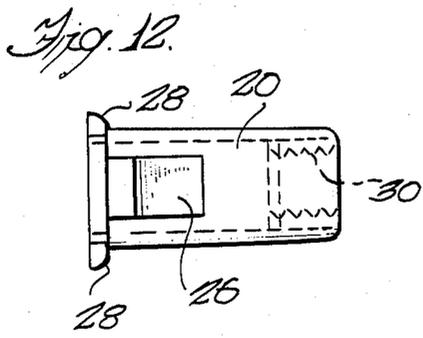
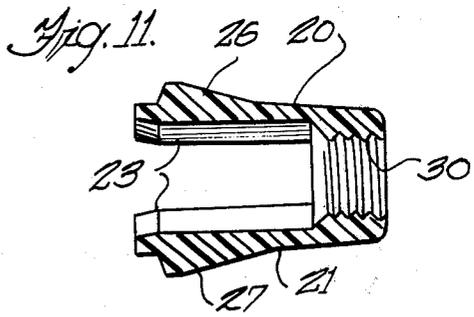
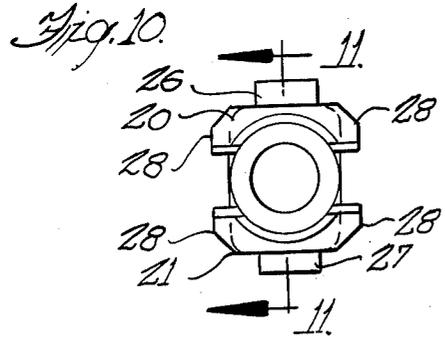
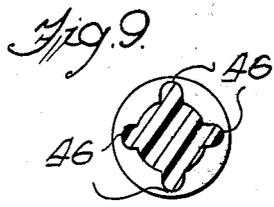
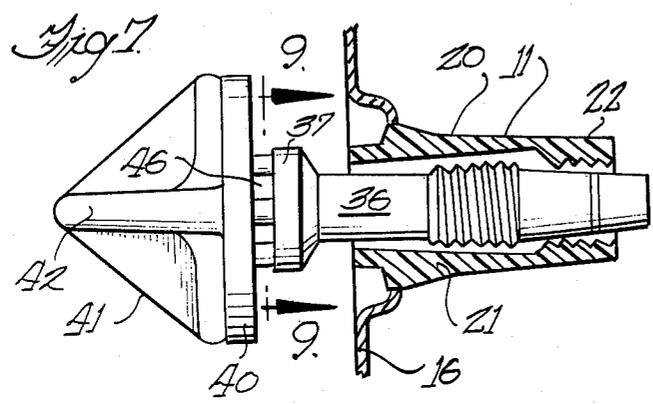
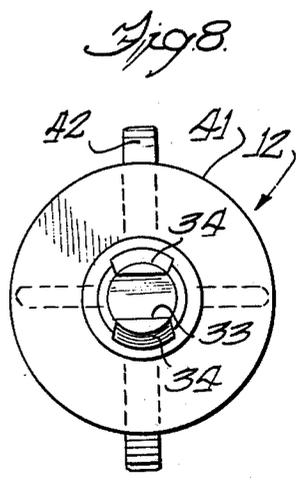
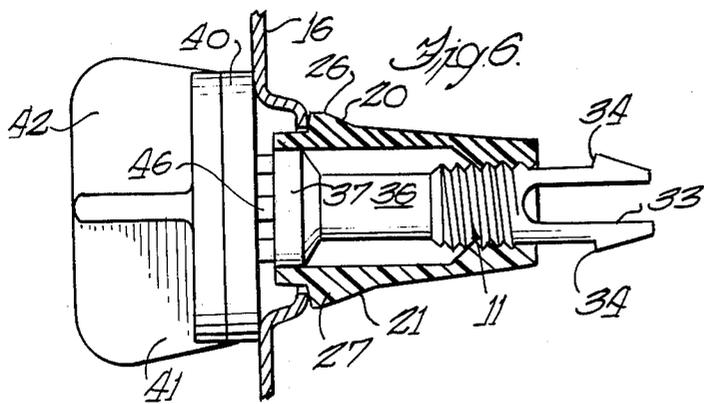
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13 Claims, 13 Drawing Figures







DRAIN PLUG ASSEMBLY**BACKGROUND OF THE INVENTION**

This invention relates generally to improvements in the structure and apparatus used primarily in the field of fluid containers, and more particularly to a drain plug assembly and its combination with such containers that provide substantial useful improvements over existing drain plug arrangements which are now commonly used in the automotive field. The drain plug assembly of this invention has particular utility when used in conjunction with automobile radiators. However, it will be understood that while the invention is directed primarily to a drain plug assembly for use with automobile radiators, the specific device disclosed herein can be used in other allied fields, such as drain plugs for chemical containers and the like.

Heretofore, drain plug assemblies formed at the bottom of automobile radiators have been of the type which are either silver soldered or brazed directly to the metal which forms the bottom tray or end cap for the radiator core. These drain plug assemblies are provided with a hollow threaded shaft through which extends a stem member having a seat portion to engage the inner peripheral edge of the threaded tube. When the stem is loosened, by rotation of wing-like members well-known in the art, the water or other coolant liquid within the radiator will be drained.

The operation of connecting the prior art drain plug assemblies to the radiator is relatively expensive and time consuming. It requires the use of a skilled operator for brazing or silver soldering the drain plug assembly to the radiator bottom pan. Furthermore, the drain plug assembly is required to be formed of either cast or forged metal having substantially the same characteristics as the metal forming the radiator so they can be joined together by silver soldering or brazing. The high cost of silver solder and braze rod also adds to the overall cost of forming drain plugs on radiators in this manner.

SUMMARY OF THE INVENTION

Accordingly, an object of this invention is to provide a new and improved drain plug assembly which can be fastened to a radiator of an automobile without the need of silver solder or brazing.

Another object of this invention is to provide a new and improved drain plug assembly which can be fastened to automobile radiator assemblies by merely inserting the plug assembly into an aperture formed in the radiator, this being accomplished readily by non-skilled labor.

Another object of this invention is to provide a new and improved drain plug assembly which provides an improved seal about the drain plug opening and which will withstand the increased pressure within its associated container as a result of the high temperature of the fluid therein.

Still another object of this invention is to provide a new and improved drain plug assembly and an embossment configuration on the wall portion of the container receiving the same that is highly efficient in maintaining the container in a sealed condition until such time as the drain plug is opened.

Yet another object of this invention is to provide a drain plug assembly wherein the body portion of the drain plug and the stem portion thereof are maintained

in an assembled condition even when the stem portion is fully unthreaded from the body portion for draining of liquid from within its associated container.

Many other objects, features and advantages of this invention will be more fully realized and understood from the following detailed description when taken in conjunction with the accompanying drawings wherein like reference numerals throughout the various views of the drawings are intended to designate similar elements or components.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective exploded view of a drain plug assembly and a portion of fluid container configured to cooperate therewith and constructed in accordance with the principles of this invention;

FIG. 2 is a side elevational view of the drain plug assembly of FIG. 1 further illustrating the various aspects of the invention;

FIG. 3 illustrates the drain plug assembly fully inserted into the aperture within the wall of the fluid container and further illustrates the head portion forming a seal about the periphery of the aperture;

FIG. 4 illustrates the drain plug assembly in an opened condition to allow fluid from within the container to the drain;

FIG. 5 is an end view of the drain plug assembly of this invention illustrating the tab portions formed on the head to facilitate hand manipulation of tightening and loosening of the stem member;

FIG. 6 is a side sectional view taken along line 6—6 of FIG. 5;

FIG. 7 illustrates the drain plug assembly of this invention with the body portion thereof somewhat collapsed in the area of a reduced diameter portion of the stem member which facilitates insertion of the body portion into the aperture formed in the container receiving the same;

FIG. 8 is an end view of the stem member of the drain plug assembly of this invention;

FIG. 9 is an end sectional view taken along line 9—9 of FIG. 7 illustrating the ribbed portion of the stem to provide minimum contact with the inner periphery of the washer forming the seal at the head portion;

FIG. 10 is an end view of the body portion of the drain plug assembly of this invention;

FIG. 11 is a sectional view taken along line 11—11 of FIG. 10;

FIG. 12 is a side view of the body portion of the drain plug assembly of this invention; and

FIG. 13 is an end view of the body member as viewed from the end having the threaded opening therein to receive the stem member.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now to FIGS. 1 and 2, there is seen a drain plug assembly constructed in accordance with the principles of this invention and is designated generally by reference numeral 10. The drain plug assembly 10 includes a body member 11, cooperable with a stem member 12 and insertable into an aperture 13. The aperture 13, most advantageously, is formed in an embossment 14 of a wall portion 16 which is part of a fluid container, not here illustrated in its entirety. The fluid container may be a radiator of an automobile, it being understood that other types of containers can utilize

the drain plug assembly of this invention. The embossment 14 is formed by an inwardly directed portion 17 thereby providing a flat wall surface 18 on the outside of the container immediately adjacent the embossment and which cooperates with the stem member 12 to form a fluid tight seal about the aperture 13.

The body member 11 has spaced apart wall-like portions 20 and 21 joined together by material 22 at one end thereof and spaced apart by slot means 23. The other end 24 of the wall portions 20 and 21 are readily resiliently urged toward one another by pressing together. Preferably, the body member 11 and stem member 12 are of molded plastic material of a type suitable to withstand high temperatures and provide substantial strength while still maintaining a slight degree of resiliency to allow the wall portions to be urged together. One such type of plastic material is PLASKON 8233.

Extending outwardly from the wall portions 20 and 21 are first shoulder means 26 and 27, respectively, which have forwardly directed inclined leading edges 26a and 27a. Second shoulder means 28 are formed at the terminating end 24 of the wall portions and cooperate with first shoulder means to lock the body member in position within the aperture as best seen in FIG. 3. The body member 11 is inserted into the aperture 13 after the stem member 12 has been assembled thereto. However, the body member 11 may be inserted into the aperture 13 first and thereafter the stem member 12 may be inserted into the body member 11.

The body member 11 has an opening 30 formed at the tied together end, which opening is provided with threads to receive corresponding threads 31 formed on a shaft 32 of the stem member 12. While a threaded engagement between the body member 11 and stem member 12 is illustrated, it will be understood that other fastening and unfastening connections may be incorporated such as quarter-turn cam lock configurations, or the like.

The stem member 12 has the shaft portion 32 thereof provided with a slot 33 at one end. Directed transversely outwardly of the slot 33 are shoulder portions 34 which are urged together when passing through the opening 30 and thereafter spread apart to retain the stem member in engagement with the body member even after being threadedly disconnected therefrom. The material holding the wall portions together is of a predetermined thickness as indicated by the letter D. To insure complete threaded disengagement of the stem member, a corresponding thickness D' is maintained between the shoulder portion 34 and the beginning of the threads 31. The distance D' is at least equal to or greater than the distance D.

To facilitate inserting the assembled drain plug into the aperture 13, the shaft 32 is provided with a reduced diameter portion 36 so that the end 24 of the body portion can be squeezed together, as indicated in FIG. 7. Immediately adjacent the reduced diameter portion is an enlarged diameter shoulder portion 37 which then is urged against the inner periphery of the wall portions 20 and 21, as best seen in FIG. 6, to maintain the shoulders 26 and 27, together with the shoulder means 28, in an outwardly urged condition so that the drain plug will not dislodge or loosen from the aperture under the influence of high pressure within the radiator or other container at elevated temperatures.

To insure a long life seal engagement with the wall surface about the embossment 14, a resilient washer-like member 40 is positioned immediately adjacent a head portion 41 formed at the other end of the stem member 12. The washer member 40 is formed of material such as rubber, neoprene, or other suitable deformable and non-hardening material. The head portion 41 is provided with a tab member 42 to be grasped by the hand and threadedly turned during tightening and loosening.

As best seen in FIG. 4, when the drain plug assembly is opened, fluid from within the container passes through the slot means 23 and about the shaft member 32. To insure that the washer-like member does not rotate during the final tightening operation as it is being urged firmly against the peripheral surface of the wall portion 18, a plurality of rib elements 46 are formed immediately adjacent the enlarged diameter portion 37. These ribs provide minimum contact with the washer. While four ribs are here illustrated, three ribs may be formed if desired.

What has been described is a simple, inexpensive and efficient drain plug assembly for insertion into an aperture formed in an embossment on a wall portion of a container. Variations and modifications of the illustrated invention may be made without departing from the spirit and scope of the novel concepts disclosed and claimed herein.

The invention is claimed as follows:

1. A drain plug assembly for connection to a fluid container comprising: an embossment forming a recess in a wall surface of the said container, said recess including a base and a continuous sidewall having a predetermined height, an aperture formed in said base, a body member having a pair of spaced apart portions joined together at one end thereof and slot means extending from adjacent said one end to the other end of said spaced apart portions, first shoulder means formed on said spaced apart portions intermediate the ends thereof, second shoulder means formed at said other end of said spaced apart portions and cooperable with said first shoulder means to firmly hold said body portion within said aperture formed in said embossment and with said second shoulder means having an axial extent equal to or less than said predetermined height to maintain said second shoulder means totally within said recess and below the wall surface of said container, said spaced apart portions adapted for resilient movement toward one another during insertion of said body member into said aperture, a stem member having an elongated shaft to be inserted into said body member between said spaced apart portions, fastener means formed on said elongated shaft and in said body member to provide a locking action therebetween when said stem member is tightened to said body member, a head portion formed at an exterior end of said elongated shaft, said head portion providing an area radially outwardly of said shaft to completely overlie said apertured recess and engage the wall surface about said recess to form a seal thereabout when said stem member is tightened to said body member, whereby untightening of said stem from said body member will disengage said head portion from the wall surface about said recess and fluid from within said container will flow from between said slot means of said body member and said shaft.

2. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said head portion includes a resilient seal element positioned about said shaft to provide a seal between said head portion and the wall surface about said recess.

3. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 2, wherein said resilient seal is a washer-like member having an aperture to receive said shaft, and a plurality of ribs formed on said shaft adjacent said head portion to provide minimum contact area between said shaft and said washer-like member, whereby said washer-like member will remain substantially stationary when in contact with said wall surface during tightening of said stem member.

4. In the drain plug assembly for connection to the wall of a fluid contained as set forth in claim 3, said plurality of ribs defining a plurality of voids between adjacent ribs, said voids having a volume sufficient to accept the volume of said washer-like member which is readily expanded into said voids when the washer-like member is compressed between the wall of said fluid container and said head.

5. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said spaced apart portions are joined together with a predetermined thickness of material, a slot formed within said shaft at the end opposite said head portion, transversely outwardly directed shoulder means formed on said shaft adjacent said slot, an opening formed within said body through the material joining said spaced apart portions together, said shoulders of said shaft being urged through said opening during assembly of said drain plug, and said shoulders on said shaft retaining said stem member within said body member when they are loosened.

6. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 5, wherein female threads are formed in said opening and male threads are formed on said shaft so that said member is threadedly tightened toward said body member to urge said head portion against the wall adjacent said aperture.

7. In the drain plug assembly for connection to the wall of fluid container as set forth in claim 6, wherein said material joining said spaced apart portions together is of a predetermined thickness, said male

threads on said shaft being spaced from said shoulder means at the end of said shaft a distance at least equal to said predetermined distance to allow said threads to completely disengage and said shoulder means to retain said stem member within said body member.

8. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 7 wherein said shaft has a reduced diameter portion adjacent the threaded portion thereof toward the head portion to allow collapsing of said spaced apart portions of said body member during insertion of said drain plug assembly into said aperture of the fluid container receiving the same.

9. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 8, further including an enlarged diameter portion immediately adjacent to said reduced diameter portion and adjacent said head portion to provide an abutment surface against said other end of said spaced apart portions to maintain said first and second shoulder means of said spaced apart portions in firm engagement with the periphery of said aperture when said stem member is firmly tightened within said body member.

10. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said body member is substantially rectangular in configuration to fit within a rectangular aperture, thereby preventing rotation of said body member during tightening and loosening of said stem member.

11. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said first shoulder means are provided with sloping forward edges relative to a plane passing through said second shoulder means to provide a gradually diminishing space between the locking surface edges of said first and second shoulder means to accommodate different thicknesses of wall material forming the fluid container.

12. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said head portion is provided with tab means for hand manipulation during tightening and loosening of said stem member.

13. In the drain plug assembly for connection to the wall of a fluid container as set forth in claim 1, wherein said embossment is directed inwardly of the container.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,910,550 Dated October 7, 1975

Inventor(s) JOHN FREDERICK NELSON

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 5, line 17, "contained" should be --container--

Col. 5, line 40, before "member" insert --stem--

Signed and Sealed this

tenth Day of February 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks