

PATENT SPECIFICATION

(11)

1 358 773

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(21) Application No. 47465/71

(22) Filed 12 Oct. 1971

(19)

(44) Complete Specification published 3 July 1974

(51) International Classification A47K 1/14

(52) Index at acceptance

A4N 3F2

(72) Inventor SHU-LIEN LIOU



(54) DRAIN PLUG

(71) We, SHU-LIEN LIOU and CHIN-CHIH CHUANG, both Chinese citizens, respectively of 195 Chung King North Road, Sec. 3, Taipei, Taiwan, Republic of China, and No. 10 Lane 123 Sung Chiang Road, Taipei, Taiwan, Republic of China, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to drain plugs.

Drain plugs for use, for example, in household wash basins, bath tubs and the like, usually consist of a drain socket and a plug, such as of rubber or metal. The plug is usually anchored by a chain to prevent it being lost. The drain socket usually has a tapered wall to effect more secure fastening of the plug within the socket. However, when the tapered socket is shallow and not very steep, the plug tends to slip off, especially when the chain is accidentally tripped. If the socket has a steeper wall and is of substantial depth, considerable force is required to pull the plug, thus increasing the possibilities of breaking the chain and losing the plug.

Another type of drain plug is similar to those used in public toilets on passenger trains, and has a stemmed plug which is operated by levers installed under the basin. The complexity and expense of such a plug makes it commercially unsuitable for household use.

In accordance with one feature of the invention, there is provided a drain plug for use with a drain socket, comprising a stem for mounting on the socket for movement axially thereof, biasing means arranged to bias the stem in one axial direction, and a resilient plug member carried by the stem and having two stable configurations, a first in which the plug member has a concave surface facing downwardly so that its rim can seal, in use, against a complementarily shaped portion of the socket and a second in which its rim is displaced upwardly rela-

tive to its centre to create, in use, a passage between the rim and said portion of the socket.

In accordance with another feature of the invention there is provided a drain plug and socket assembly, comprising a stem mounted on the socket and movable relative to the socket between extreme upper and lower positions, biasing means arranged to bias the stem in one axial direction towards its upper position, and a resilient plug member having two stable configurations, one in which it has a concave surface facing downwardly with its rim sealing against a complementarily shaped portion of the socket and a second in which its rim is displaced upwardly relative to its centre to define a passage between the rim and the socket.

One form of drain plug in accordance with the invention in combination with a conventional drain socket will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 depicts in sectional elevation view the combination in which a diaphragm plug member is concave downwardly in a first configuration;

Figure 2 depicts the combination of Figure 1 with the drain plug member in a second configuration; and

Figure 3 depicts a top view of the conventional drain socket.

Figure 3 shows a conventional drain socket 10, comprising a lip portion 5 and a drain spider 6 cast integrally with a socket body 1.

In Figures 1 and 2, the same numbers denote the same parts. In the centre hole of drain spider 6, there is inserted a hollow shaft member 3 which is threaded on its outside surface and which is tightly locked to spider 6 by nuts 7 and 11. Shaft member 3 can be fastened by other means to spider 6; for example, either nut 7 or nut 11 can be replaced by a flange which is cast together with the hollow shaft member 3 and only the other nut used to lock the shaft member to the drain spider 6. Within hollow shaft member 3 is a coil compression spring 4 and

[Price 25p]

Price 75p

a stem 2 is inserted through the centre of spring 4 and through the bottom hole 12 of shaft member 3, the stem 2 having a shoulder 13 providing a seat for spring 4. The lower end of stem 2 is step cut as shown and is slotted or has a hole made therein to facilitate mounting of a stop member in the form of a washer, snap ring or cotter pin 8. The stop member engages the bottom of shaft member 3 and retains the stem 2 within shaft member 3. The stem is thus movable between extreme upper and lower positions.

On top of stem 2 is a caphead 14, which may be shaped like a rivet head and is used to connect stem 2 to the plug member 9. The plug member 9 is made of flexible, elastic material such as rubber or plastics. The caphead 14 may be inserted into the connecting portion 15 of plug member 9 in the manner depicted, or in any like manner which connects the plug member 9 to stem 2.

Plug member 9 is of a diaphragm construction and is shown in Figure 1 in a first stable configuration with a concave surface facing downwardly. In this position the plug member is displaced from the shaft member 3 and its rim is pressed tightly against lip portion 5 of drain socket 10, the lip portion being of a complementary shape to the rim of the plug member. Force is exerted upwardly by compression spring 5 through stem 2 and caphead 14 against the centre of diaphragm plug member 9. This force holds the plug member in its stable position. The water or liquid contained in a basin or tub exerts a hydraulic pressure on the plug member to hold the edge of the plug member against the lip portion of the drain socket. The edge of the plug member is suitably angled to ensure sealing engagement with the lip portion.

As shown in Figure 2, the "drain" position of plug member 9 is achieved when the rim of member 9 is displaced upwardly relative to the centre. Water or liquid may then drain through the opening between the lip portion 5 and the rim of the plug member 9. The "drain" position is obtained by first pushing down on the centre portion of plug member 9 against the upward force of spring 4 to cause the rim of the elastic plug member 9 to bend upwardly (as shown by dotted lines in Figure 2). Thereafter, plug member 9, which is now concave upwardly is released and moves to the second stable configuration in which a passage exists between the edge of the plug member 9 and the lip 5 (as shown by solid lines in Figure 2).

The upward biasing force against the centre of the plug member 9 may be exerted by a mechanism equivalent to the compression spring 4 which serves to bias the plug member 9 in the manner described.

The stem 2, spring 4, shaft member 3, nuts 7 and 11, pin 8, drain socket 10, and the other elements (except the plug member

9) may be made of any suitable material, such as stainless steel, etc.

The above-described drain plug is simple and inexpensive and presses sealingly against the drain socket by the action of the pressure of liquid contained in the basin or tub. The plug eliminates the anchoring chain of known plugs and avoids the disadvantages of such known plugs, for example, the possible loss of the plug due to drain breakage.

The foregoing embodiment is intended for illustrative purposes only. Numerous modifications and variations thereof would be evident to one skilled in the art. All such modifications and variations are to be considered within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A drain plug for use with a drain socket, comprising a stem for mounting on the socket for movement axially thereof, biasing means arranged to bias the stem in one axial direction, and a resilient plug member carried by the stem and having two stable configurations, a first in which the plug member has a concave surface facing downwardly so that its rim can seal, in use, against a complementarily shaped portion of the socket and a second in which its rim is displaced upwardly relative to its centre to create, in use, a passage between the rim and said portion of the socket.

2. A drain plug according to claim 1, further comprising a hollow shaft member adapted to be connected to the socket, the stem being located in and axially slidable relative to the shaft member.

3. A drain plug according to claim 2, wherein the biasing means is arranged to bias the stem to a position in which the plug member is displaced from the shaft member, wherein the stem is movable relative to the shaft member axially thereof against the bias to move the plug member towards the shaft member.

4. A drain plug according to claim 3, wherein the biasing means is a coil compression spring seating at one end against a seat formed on the shaft member and at the other end against a shoulder formed on the stem, the stem extending within the spring.

5. A drain plug according to claim 4, wherein the stem carries at one end a stop member arranged to abut the shaft member and limit relative movement between the stem and the shaft member, and carries at the other end the plug member.

6. A drain plug according to any of claims 2 to 5, further comprising means for connecting the shaft member to the socket.

7. A drain plug according to any of the preceding claims, wherein the edge of the rim of the plug member is angled to ensure, in use, sealing engagement with the socket

a stem 2 is inserted through the centre of spring 4 and through the bottom hole 12 of shaft member 3, the stem 2 having a shoulder 13 providing a seat for spring 4. The lower end of stem 2 is step cut as shown and is slotted or has a hole made therein to facilitate mounting of a stop member in the form of a washer, snap ring or cotter pin 8. The stop member engages the bottom of shaft member 3 and retains the stem 2 within shaft member 3. The stem is thus movable between extreme upper and lower positions.

On top of stem 2 is a caphead 14, which may be shaped like a rivet head and is used to connect stem 2 to the plug member 9. The plug member 9 is made of flexible, elastic material such as rubber or plastics. The caphead 14 may be inserted into the connecting portion 15 of plug member 9 in the manner depicted, or in any like manner which connects the plug member 9 to stem 2.

Plug member 9 is of a diaphragm construction and is shown in Figure 1 in a first stable configuration with a concave surface facing downwardly. In this position the plug member is displaced from the shaft member 3 and its rim is pressed tightly against lip portion 5 of drain socket 10, the lip portion being of a complementary shape to the rim of the plug member. Force is exerted upwardly by compression spring 5 through stem 2 and caphead 14 against the centre of diaphragm plug member 9. This force holds the plug member in its stable position. The water or liquid contained in a basin or tub exerts a hydraulic pressure on the plug member to hold the edge of the plug member against the lip portion of the drain socket. The edge of the plug member is suitably angled to ensure sealing engagement with the lip portion.

As shown in Figure 2, the "drain" position of plug member 9 is achieved when the rim of member 9 is displaced upwardly relative to the centre. Water or liquid may then drain through the opening between the lip portion 5 and the rim of the plug member 9. The "drain" position is obtained by first pushing down on the centre portion of plug member 9 against the upward force of spring 4 to cause the rim of the elastic plug member 9 to bend upwardly (as shown by dotted lines in Figure 2). Thereafter, plug member 9, which is now concave upwardly is released and moves to the second stable configuration in which a passage exists between the edge of the plug member 9 and the lip 5 (as shown by solid lines in Figure 2).

The upward biasing force against the centre of the plug member 9 may be exerted by a mechanism equivalent to the compression spring 4 which serves to bias the plug member 9 in the manner described.

The stem 2, spring 4, shaft member 3, nuts 7 and 11, pin 8, drain socket 10, and the other elements (except the plug member

9) may be made of any suitable material, such as stainless steel, etc.

The above-described drain plug is simple and inexpensive and presses sealingly against the drain socket by the action of the pressure of liquid contained in the basin or tub. The plug eliminates the anchoring chain of known plugs and avoids the disadvantages of such known plugs, for example, the possible loss of the plug due to drain breakage.

The foregoing embodiment is intended for illustrative purposes only. Numerous modifications and variations thereof would be evident to one skilled in the art. All such modifications and variations are to be considered within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A drain plug for use with a drain socket, comprising a stem for mounting on the socket for movement axially thereof, biasing means arranged to bias the stem in one axial direction, and a resilient plug member carried by the stem and having two stable configurations, a first in which the plug member has a concave surface facing downwardly so that its rim can seal, in use, against a complementarily shaped portion of the socket and a second in which its rim is displaced upwardly relative to its centre to create, in use, a passage between the rim and said portion of the socket.

2. A drain plug according to claim 1, further comprising a hollow shaft member adapted to be connected to the socket, the stem being located in and axially slidable relative to the shaft member.

3. A drain plug according to claim 2, wherein the biasing means is arranged to bias the stem to a position in which the plug member is displaced from the shaft member, wherein the stem is movable relative to the shaft member axially thereof against the bias to move the plug member towards the shaft member.

4. A drain plug according to claim 3, wherein the biasing means is a coil compression spring seating at one end against a seat formed on the shaft member and at the other end against a shoulder formed on the stem, the stem extending within the spring.

5. A drain plug according to claim 4, wherein the stem carries at one end a stop member arranged to abut the shaft member and limit relative movement between the stem and the shaft member, and carries at the other end the plug member.

6. A drain plug according to any of claims 2 to 5, further comprising means for connecting the shaft member to the socket.

7. A drain plug according to any of the preceding claims, wherein the edge of the rim of the plug member is angled to ensure, in use, sealing engagement with the socket



when the plug member is in its first configuration.

5 8. A drain plug according to any of the preceding claims, wherein the plug member is made of rubber or plastics material.

9. A drain plug substantially as herein described with reference to Figures 1 and 2 of the accompanying drawings.

10 10. A drain plug and socket assembly, comprising a stem mounted on the socket and movable relative to the socket between extreme upper and lower positions, biasing means arranged to bias the stem in one axial direction towards its upper position, and a resilient plug member having two stable configurations, one in which it has a concave surface facing downwardly with its rim sealing against a complementarily shaped portion of the socket and a second in which its rim is displaced upwardly relative to its centre to define a passage between the rim and the socket.

20 11. An assembly according to claim 10, wherein movement of the stem axially downwardly against the action of the biasing

means when the plug member is in its first configuration causes the rim of the plug member to press against said portion of the socket and move relative to the centre of the plug, release of the stem resulting in the plug member adopting its second configuration. 30

12. An assembly according to claim 10 or 11, wherein the socket carries an axially extending hollow shaft member, and wherein the stem is supported in and extends through the shaft member. 35

13. An assembly according to claim 12, wherein the biasing means is a coil compression spring which surrounds the stem. 40

14. A drain plug and socket assembly constructed and arranged to operate substantially as herein described with reference to the accompanying drawings.

A. A. THORNTON & CO.,
Chartered Patent Agents,
Northumberland House,
303—306 High Holborn,
London, W.C.1.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

