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[54] **QUICK ACTION PLUGGING DEVICE**  
**11 Claims, 12 Drawing Figs.**

[52] U.S. Cl. .... **220/24.5,**  
**215/52, 138/89**  
 [51] Int. Cl. .... **B65d 39/12,**  
**F161 55/12**  
 [50] Field of Search .... **220/24.5;**  
**215/52, 53, 54; 217/78, 108, 109; 138/89**

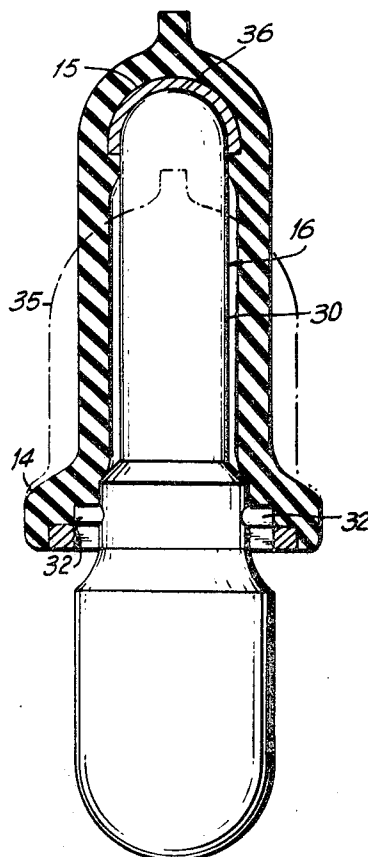
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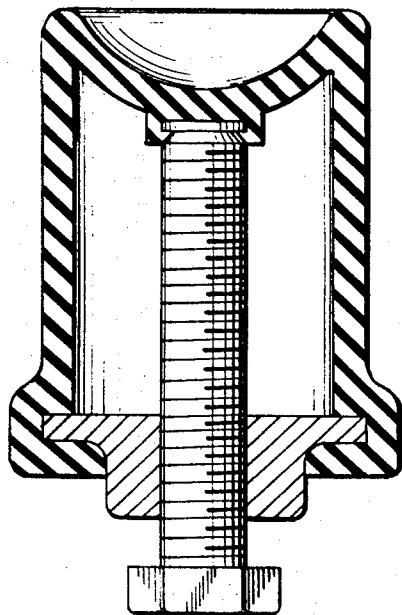
Primary Examiner—George E. Lowrance  
 Attorney—Curtis, Morris & Safford

**ABSTRACT:** In a plugging device, for example, a plugging device in which an expandible stopper is adapted to be engaged by an expander movable along the longitudinal axis of the stopper to expand the stopper axially, the stopper has a bearing portion at the closed end thereof against which the expander bears as the expander is moved along the longitudinal axis of the stopper and the stopper is expanded, and a washerlike member is disposed substantially perpendicular to the longitudinal axis of the stopper adjacent the open end thereof; the washerlike member has an inner and an outer periphery and includes a slotted portion arranged along the inner periphery thereof, the slotted portion directly communicating with the outside of the stopper at the open end and being mateable with the expander and adapted for rapid insertion and removal of the expander in cooperation with the slotted portion to rapidly expand and contract the stopper; and said washerlike member further includes a lockable portion for locking the stopper in the axially expanded position, whereby the expander inserted through the mateable portion expanding the stopper longitudinally can be retained in the stopper in the rapidly expanded position. The expander includes an axially extending portion adapted at one end to expand the plug by axial insertion within the plug, and the axially extending portion includes at the other end a portion having circumferentially arranged protrusions extending therefrom in a direction transverse to the axis of insertion, the protrusions being adapted to pass through the slotted portion of the washerlike member and to be positioned so as to retain the expander within the plug in the inserted and expanded position.

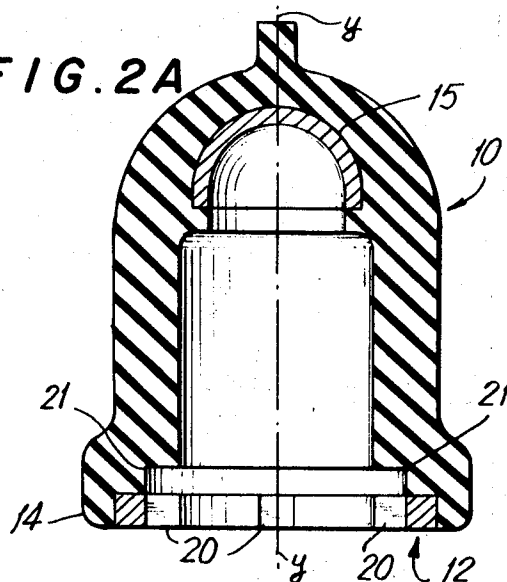


**FIG. 1**

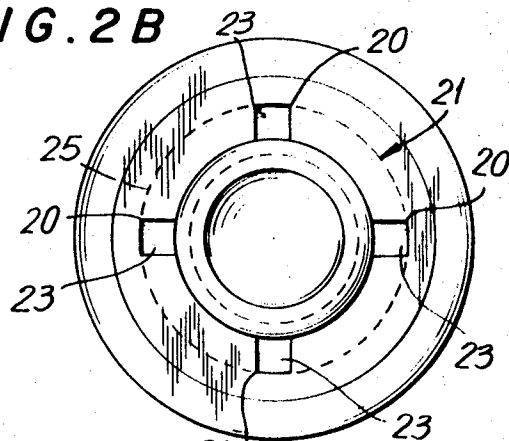
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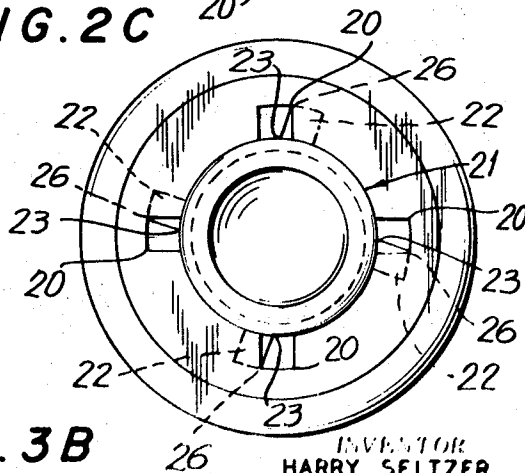
**FIG. 2A**



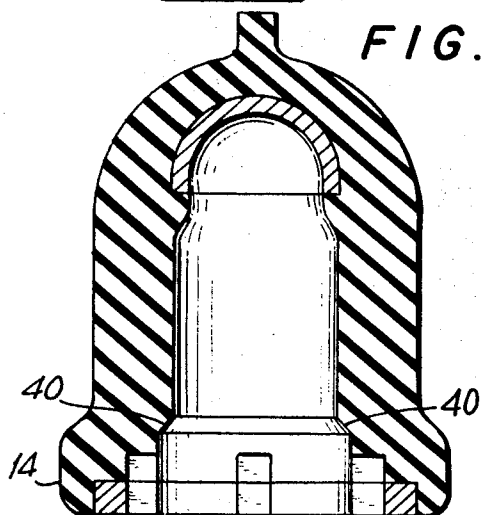
**FIG. 2B**



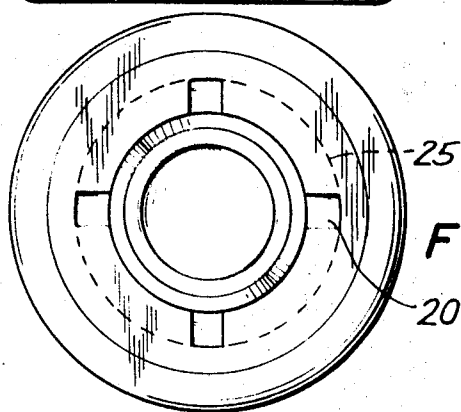
**FIG. 2C**



**FIG. 3A**



**FIG. 3B**



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FIG. 4

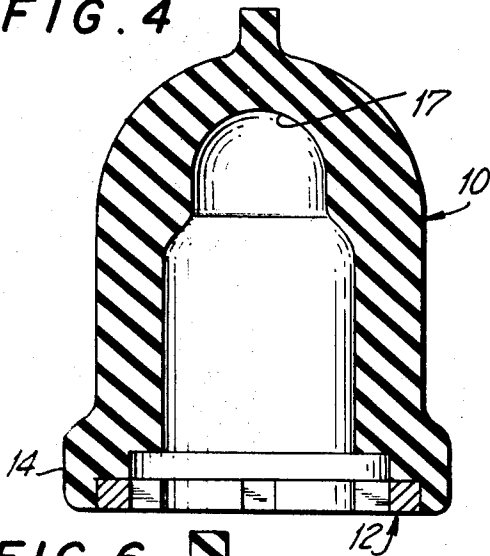


FIG. 5

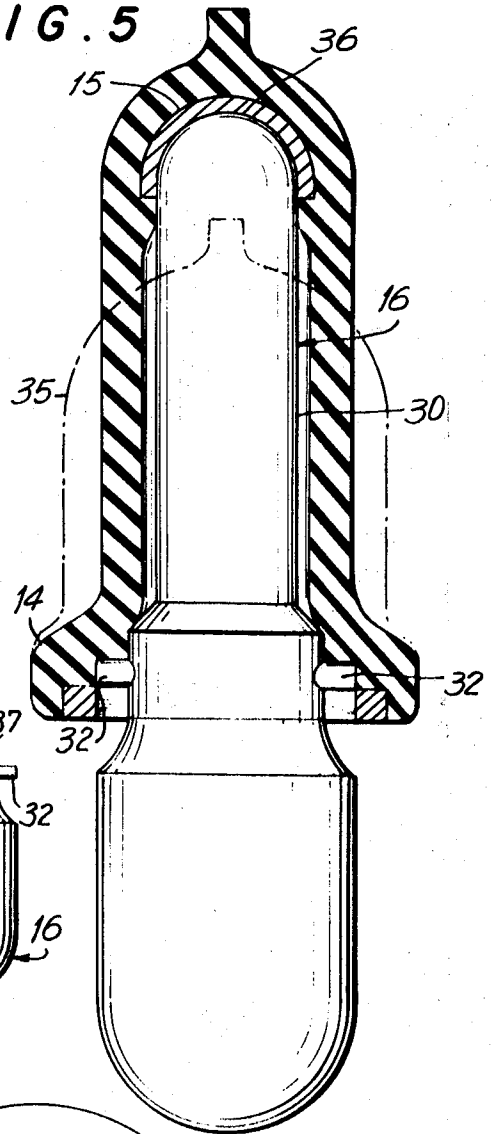


FIG. 6

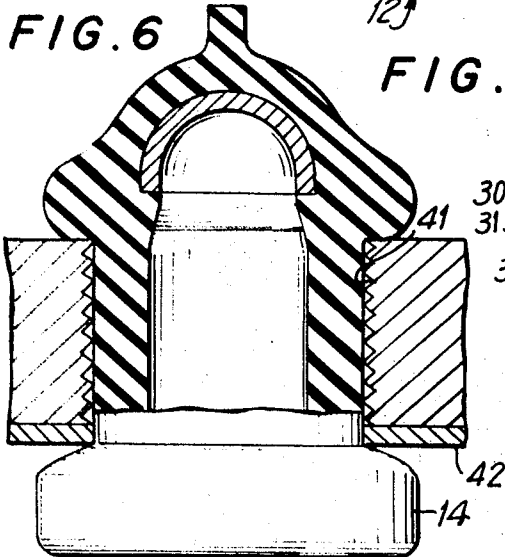


FIG. 7

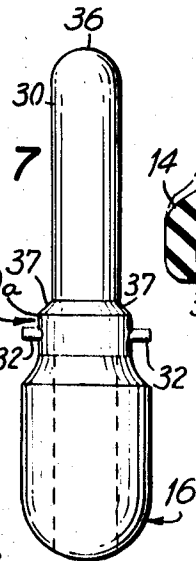


FIG. 8A

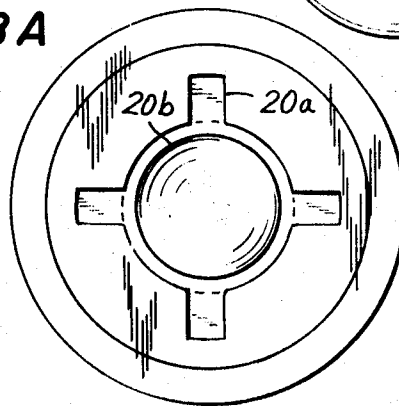
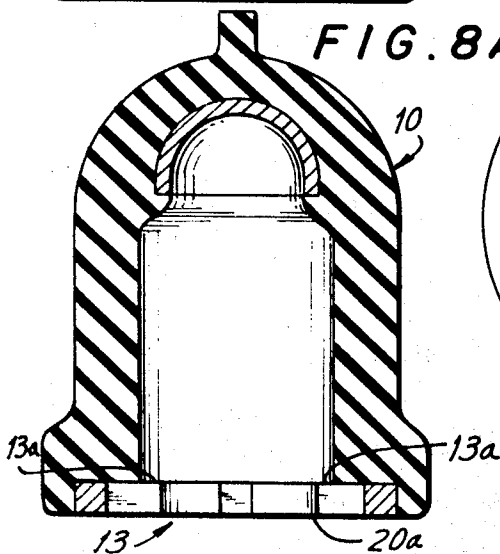


FIG. 8B

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# QUICK ACTION PLUGGING DEVICE

The present invention relates to a plugging device, and more particularly to improvements in an expandible plugging device. This plugging device may have particular application in plugging the outlet of an automobile crankcase. It will be readily apparent, however, that this plugging device has considerably broader application and may be employed in various other machines where fluid retaining members have outlets which normally are plugged.

Conventional crankcase plugs are either threaded members which are inserted into correspondingly threaded outlets in the crankcase, or expandible plugs, having a threaded portion which receives a correspondingly threaded member therein for expansion and subsequent contraction of the plug thereby, such as disclosed in U.S. Pat. No. 3,307,731 issued to the same inventor. A common problem in the regular servicing of automobiles is that during removal of the crankcase plug to drain the lubricant from the crankcase, or during insertion of a crankcase plug to plug the outlet after draining, the internal thread in the outlet of the crankcase or the external thread of the plug is often stripped. Stripping of the thread may occur during the very first removal or insertion of the crankcase plug, or may result after several drainings of the crankcase.

In an attempt to solve this problem, self-tapping crankcase plugs have been utilized, but they are unsatisfactory because the diameter of the outlet is enlarged with each draining of the crankcase. The use of such plugs is limited by the maximum opening into which they may be fitted. Once the maximum is reached the crankcase unit must be removed and a new one substituted. This results in increased cost and loss of time.

Another attempt to solve this problem has been through the use of expandible plugs. These expandible plugs have threaded portions that receive a correspondingly threaded member to cause the plug to expand and subsequently contract. Although plugs of this type are more satisfactory than either self-tapping crankcase plugs or other conventional threaded plugs, expandible plugs are also subject to stripping of the thread requiring replacement of the plug, and thus increased cost.

Threads in general are subject to rust and clogging which may also necessitate replacement of the plug. Fabrication of threaded plugs of either type requires a relatively time consuming thread-cutting operation instead of a simple stamping operation, and care must be taken that the threads on both the threaded member and the thread receiving portion correspond and are not imperfectly formed. Furthermore, expandible plugs of the threaded type require considerable time both to expand the plug for insertion and to contract the plug for seating due to the requirement of threading. Thus the use of threaded expandible plugs, although a substantial improvement over previous types of plugs, may still be time consuming and costly.

Accordingly, an object of the present invention is to provide a new and improved plugging device. Another object of the present invention is to provide a new and improved expandible plugging device. A further object of the present invention is to provide a new and improved expandible plugging device having neither internal nor external threading. A still further object of the present invention is to provide a new and improved plug expander device for use with expandible plugs that permits rapid insertion and removal of the plug. Yet another object of the present invention is to provide an expandible plug that is simple in construction and easy to fabricate.

A plugging device according to one aspect of this invention, for example, includes an expandible stopper having an open end and a closed end adapted to be engaged by an expander movable along the longitudinal axis of the stopper, whereby the stopper is expanded axially, a bearing portion within the stopper at the closed end thereof against which the expander bears as the expander is moved along the longitudinal axis of

the stopper and the stopper is expanded, and a washerlike member disposed substantially perpendicular to the longitudinal axis of the stopper adjacent the open end thereof. The washerlike member has an inner and an outer periphery, and has a slotted portion arranged along the inner periphery that directly communicates with the outside of the stopper at the open end. The slotted portion is mateable with the expander for rapid insertion and removal of the expander to rapidly expand and contact the stopper. The washerlike member also has a lockable portion adjacent its inner periphery adapted to engage the expander inserted through the slotted portion expanding the stopper, thereby to retain the stopper in the expanded position. The bearing portion within such an expandible stopper may be defined by the inner surface of the stopper at its closed end or by a bearing piece secured at the closed end of the stopper. The expander for such a plugging device may have an axially extending portion adapted at one end to expand the plugging device by axial insertion within the device, and at the other end a portion with protrusions circumferentially arranged and extending in a direction transverse to the axis of insertion. The protrusions are adapted to be mateable with and to pass through the slotted portion of the washerlike member to engage the lockable portion of the washerlike member and to retain the expander within the plug in the inserted and expanded position.

Further objects, features and advantages of the invention will be apparent from the following detailed description of illustrative embodiments of the invention, which is to be read in conjunction with the accompanying drawings, in which:

FIG. 1 is an axial section of a prior art threaded expandible plugging device;

FIG. 2A is an axial section of an expandible stopper in accordance with an embodiment of the present invention;

FIG. 2B is a bottom plan of the embodiment shown in FIG. 2A;

FIG. 2C is a bottom plan of another embodiment of the embodiment shown in FIG. 2A;

FIGS. 3A, 4 and 8A are axial sections of expandible stoppers of other embodiments of the present invention;

FIG. 3B is a bottom plan of the embodiment shown in FIG. 3A;

FIG. 5 is an axial section of a plugging device in accordance with the stopper embodiment shown in FIG. 3A;

FIG. 6 is an axial section of the embodiment shown in FIG. 5 after it has been inserted in an outlet;

FIG. 7 is an elevation of the expander shown in FIG. 5; and FIG. 8B is a bottom plan of the embodiment shown in FIG. 8A.

Referring initially to FIG. 2A, a plugging device constructed in accordance with the present invention may include an expandible stopper 10. The stopper 10 desirably should be fluid impermeable, and may be fabricated of a material such as neoprene, although various other materials may be employed. The material selected should be sufficiently flexible and elastic so as to conform to the outlet into which it is inserted and, when the plugging device is being used to plug crankcase outlet, should be able to withstand the relatively high temperatures developed by a crankcase lubricant.

The expandible stopper 10 may take various forms and configurations, the particular form of the stopper illustrated in FIGS. 2A through 8B being that of a hollow bulb having a convex closed end, a flange portion 14 at the open end, and an expandible tubular section therebetween. The open end of the stopper 10 is provided with a washerlike member 12 secured thereto disposed adjacent the open end of the stopper 10. The stopper 10 further includes a bearing portion 15, 17 at the closed end of the stopper 10, against which the expander 16 (See FIG. 5) bears as the expander 16 is moved along the longitudinal axis of the stopper 10 and the stopper 10 is expanded. The bearing portion is a member 15, illustrated in FIG. 2A as a bearing piece secured to the stopper, or simply the inner surface 17 of the stopper 10 at the closed end, as shown in FIG. 4, which optionally can be reinforced by a concentration of the material of the stopper 10.

The washerlike member 12, 13 which is disposed within the open end of the stopper 10, although it may be secured to the outside edge of the stopper 10 at the open end if desired, is substantially perpendicular to the longitudinal axis  $y-y$  of the stopper 10 and is secured to it at the open end. Instead of being threaded as in prior art expandable stoppers, such as shown in FIG. 1, the washerlike member 12, 13 includes a slotted portion 20, 20a arranged along its periphery about the longitudinal axis  $y-y$  of the stopper 10 that directly communicates with the outside of the stopper at its open end. The slotted portion 20, 20a is mateable with the expander 16 and is adapted for rapid insertion and removal of the expander 16 so as to be able to rapidly expand and contract the stopper 10. Adjacent the inner periphery of the washerlike member 12, 13 is a lockable portion, generally indicated by the numeral 21, in FIGS. 2A, 2B and 2C, and by 13a in FIG. 8A, for locking the expander 16 with the stopper 10 in the axially expanded position as shown in FIG. 5.

The lockable portion of the washerlike member may be constituted by the inner surface 13a of a washerlike member 13 adjacent the slotted portions 20a of the inner surface along the inner periphery, the washerlike member having no internal groove, or by an internal groove means portion 25, 26 in a washerlike member 12. When the lockable portion is constituted by the inner surface 13a of a washerlike member 13, the stopper 10 may have an internal groove, not shown, formed in the inner surface thereof at the open end adjacent the inner periphery of the washerlike member 13 cooperatively associated with the inner surface nonslotted portions 20b so as to retain the stopper 10 in the expanded position when the expander 16 is passed through the slotted portion 20a of the washerlike member 13 and positioned in the internal groove adjacent the nonslotted portion 20b of the inner surface 13a of the washerlike member 13. The internal groove in the stopper 10 may be similar to the internal groove 25, 26 illustrated in FIGS. 2A through 5 for washerlike member 12. The inner surface 13a of the washerlike member 13 may retain the stopper 10 in the expanded position without the necessity of an internal groove in the stopper inner surface, if desired, by merely decreasing the internal diameter of the washerlike member 13 and the diameter of the expander 16 insertable therein so as to increase the surface area of the inner surface 13a, as shown in FIGS. 8A and 8B.

When the lockable portion of the washerlike member 12 is constituted by an internal groove means portion, as will be described in more detail, the internal groove means may be constituted by portions 22, shown by broken lines in FIGS. 2B, 2C and 3B, which do not directly communicate with the outside of the stopper 10, and portions 23 which directly communicate with the outside communicating slotted portion 20. The internal groove means are arranged circumferentially about the longitudinal axis  $y-y$  of the stopper 10 in cooperating relationship with the slotted portion 20 to lock the expander 16 when it is positioned in the internal groove means.

The internal groove means may be constituted by a circumferential groove 25, such as shown in FIGS. 2B, and 3B. It may also be constituted by a plurality of recesses 26, such as shown in FIG. 2C. Each of the recesses 26 has a portion 22 that does not directly communicate with the outside of the stopper 10 and a portion 23 that directly communicates with one of the outside communicating slots 20.

The plugging device is provided with an expander 16, shown in FIGS. 5 and 7, which may include an axially extending insertable portion 30 having a predetermined length greater than the internal axial length of the stopper 10 in order to expand the stopper 10 when one end 36 of the expander 16 bears against the bearing portion 15, as shown in FIG. 5. The expander may further include a lockable portion 31 at the other end of the insertable portion 30. The lockable portion 31 may have protrusions 32 thereon that extend transversely to the longitudinal axis of the expander 16. The protrusions 32—32 are mateable with and insertable through the outside communicating slotted portion 20 of the washerlike member 12, and are engageable with the internal groove means 22, 25

of the member 12 to retain the expander 16 within the stopper 10 in the inserted position with the stopper in the fully expanded condition. FIG. 5 shows the stopper 10 locked in the fully extended position and, by broken lines 35, the normal position. The lockable end 31 of the expander 16 with the protrusions 32 may be constituted by a circumferentially increased portion 30a larger than the bearing end 36. A tapered portion 37 can be utilized to join the different sized portions 30, 30a.

An expander 16 having an enlarged lockable end 31 can be used with a stopper 10 having a recessed portion adjacent the washerlike member 12 corresponding to the enlarged portion 31, e.g. an inwardly tapered portion 40 that mates with the tapered portion 37 of the expander 16 to seat the expander in the stopper in alignment with its longitudinal axis  $y-y$  as shown in FIGS. 3A and 5.

To use a plugging device according to the present invention, the axially extending portion 30 of the expander 16 is directly axially inserted into the expandible stopper 10 by passing it through the center opening in the washerlike member and the protrusions 32 through the slots 20 until the stopper 10 is in the fully expanded position, at which time the diameter of the insertable portion of the plug is decreased sufficiently to permit insertion of the plug into an outlet 41. The expander is then rotated axially until the protrusions 32 are positioned in the internal groove means 22, 25 of the lockable portion 21 of the washerlike member 12. The protrusions 32, and thus the expander, are retained by the internal groove means 22, 25, thereby preventing contraction of the stopper 10. The expanded stopper 10 can then be inserted through the outlet 41, in a crankcase for example, so the flanged portion 14 of the stopper bears against the outside surface of a fluid container 42, e.g., an oil pan. The expander 16 is then rotated axially in the opposite direction to unlock the protrusions 32 from the internal groove means 22 until the protrusions 32 are positioned solely in the slots 20, at which time the expander 16 can be withdrawn, causing the stopper 10 to contract and conform to the opening 41 to form a fluidtight seal as shown in FIG. 6. The seal is tight because the stopper 10 has a normal diameter slightly larger than the opening into which it is to be fitted. The plugging device can be removed from the opening or outlet by going through the foregoing procedure in the reverse order.

The operation of an expandible stopper 10 having a washerlike member 13 whose inner surface constitutes the lockable portion, is the same as described in relation to a washerlike member 12 having an internal groove as the lockable portion except that there is no groove in the washerlike member.

From the foregoing it will be apparent that plugging devices of the present invention permit rapid insertion and removal of plugs in outlets easily and with a minimum of effort and cost, and without threading or damage to threads. Such factors represent potential savings over conventional threaded plugs and slow-acting threaded expandable plugs, particularly in on-the-job savings of time and labor costs.

It is to be understood that the embodiments of expandible plugging devices according to this invention described above and shown in the accompanying drawings are illustrative of the invention, and that various changes and modifications can be made therein without departing from the scope of the invention as disclosed above and claimed hereafter.

I claim:

1. A plugging device comprising an expandible stopper having an open end and a closed end adapted to be engaged by an expander movable along the longitudinal axis of said stopper whereby said stopper is expanded axially, a bearing portion within said stopper at the closed end thereof against which said expander bears as said expander is moved along said longitudinal axis of said stopper and said stopper is expanded, and a washerlike member disposed substantially perpendicular to the longitudinal axis of said stopper adjacent the open end thereof, said washerlike member having an inner and an outer periphery and a slotted portion arranged along the inner

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periphery thereof, said slotted portion directly communicating with the outside of the stopper at the open end and being mateable with the expander and adapted for rapid insertion and removal of the expander in cooperation with the slotted portion to rapidly expand and contract the stopper, and said washerlike member having a lockable portion arranged along the inner periphery thereof for locking the stopper in the axially expanded position, whereby the expander inserted through the mateable portion expanding the stopper longitudinally can be retained in the stopper in the rapidly expanded position.

2. A plugging device in accordance with claim 1 wherein said bearing portion consists of the inner surface of the closed end of said expandible stopper.

3. A plugging device in accordance with claim 1 wherein said bearing portion is a bearing piece secured to said stopper at the closed end of said stopper.

4. A plugging device in accordance with claim 1 wherein said washerlike member has an inner and an outer surface having nonslotted portions and further having slotted portions constituted by said slotted portion along said inner periphery extending therethrough, said stopper has an internal groove means in the inner surface thereof at said open end adjacent the inner periphery of said washerlike member, said washerlike member inner surface comprising said lockable portion and being cooperatively associated with said internal groove and said slotted portion, said internal groove means having portions adjacent said washerlike member inner surface non-slotted portions which do not directly communicate with the outside of the stopper and portions which directly communicate with said outside communicating slotted portion, said internal groove means being arranged along the inner periphery of said washerlike member in cooperating relationship with said outside communicating slotted portion, whereby when the expander is inserted through the outside communicating slotted portion and positioned in the internal groove portions not directly communicating with the outside of the stopper, the expander is locked in position and the stopper is removably detained in said position.

5. A plugging device in accordance with claim 1 wherein said lockable portion comprises an internal groove means having portions which do not directly communicate with the outside of the stopper and portions which directly communicate with said outside communicating slotted portion, said internal groove means being arranged along the inner periphery of said washerlike member in cooperating relationship with said outside communicating slotted portion, whereby when the expander is inserted through the outside communicating slotted portion and positioned in the internal groove portions not

directly communicating with the outside of the stopper, the expander is locked in position and the stopper is removably retained in said position.

6. A plugging device in accordance with claim 5 wherein said internal groove means comprises a circumferential groove extending about the longitudinal axis of the stopper.

7. A plugging device in accordance with claim 5 wherein said outside communicating slotted portion and said internal groove means comprise a plurality of slots, each of said internal groove slots having a portion which does not directly communicate with the outside of the stopper and a portion which directly communicates with one of said outside communicating slots.

8. A plugging device in accordance with claim 1 wherein said plugging device includes an expander, said expander comprising a longitudinally axially extending insertable portion having a predetermined length greater than the internal longitudinal axial length of said stopper for expanding said stopper longitudinally when one end of said expander bears against said bearing portion, and a lockable portion at the other end of said insertable portion, said expander lockable portion having lockable means thereon adapted for insertion through said washer outside communicating slotted portion and engageable in said washer lockable portion to retain said expander within said stopper in the inserted position with said stopper in the fully expanded position when said lockable means is positioned within said washer lockable portion.

9. A plugging device in accordance with claim 8 wherein said expander lockable portion includes a portion larger than said one end, said larger portion having an inwardly tapering portion which tapers toward said one end, said lockable means being protrusions disposed on said larger portion, and said stopper includes an inwardly tapered portion adjacent its open end mateable with said expander tapered portion to seat said expander in said stopper.

10. A plug expander device comprising an axially extending portion adapted at one end to expand an expandible plug by axial insertion within the plug, and having at the other end circumferentially arranged protrusions extending therefrom in a direction transverse to the axis of insertion, said protrusions being adapted to be positioned so as to retain the expander within the plug in the inserted and expanded position.

11. A plug expander device in accordance with claim 10 wherein said other end includes a circumferentially increased portion, said circumferentially increased portion having an inwardly tapering portion tapered toward said one end and being adapted to be seated in the plug, and said protrusions being disposed on said increased portion.

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