July 14, 1959 A. WALTER 2,894,264

FLUSH VALVE GUIDES

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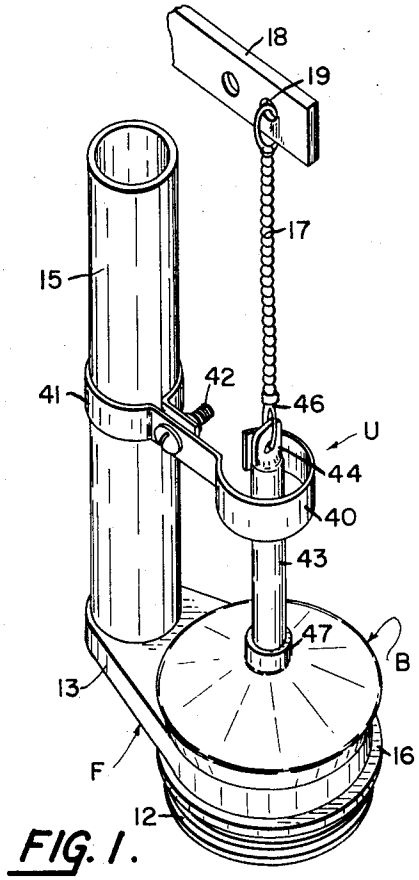


FIG. 1.

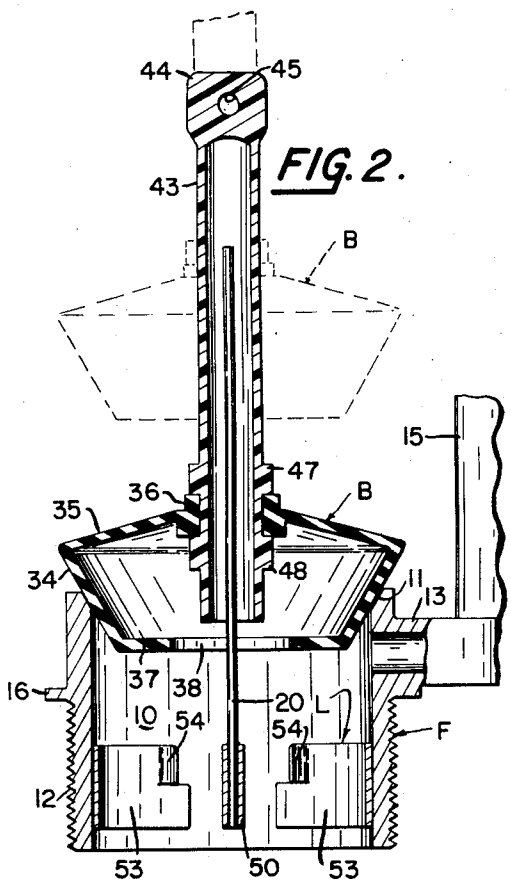


FIG. 2.

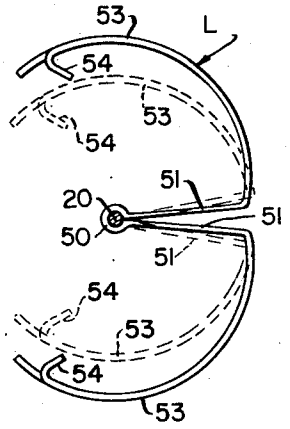


FIG. 3.

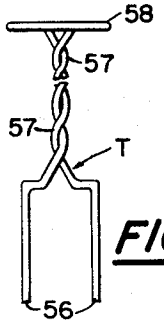


FIG. 4.

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FIG. 5.

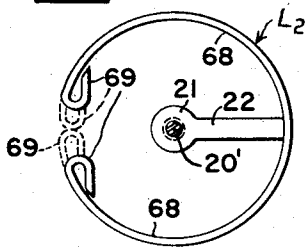


FIG. 6.

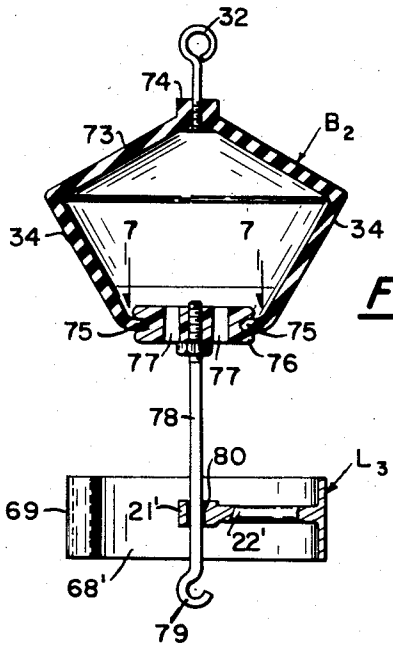
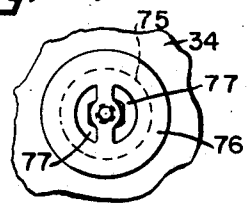


FIG. 7.



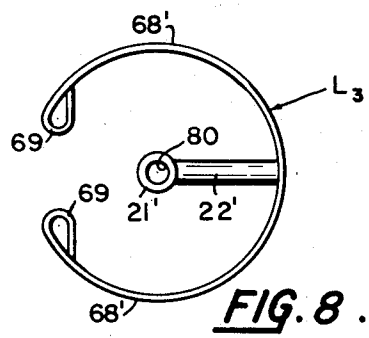


FIG. 8.

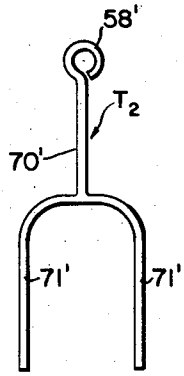
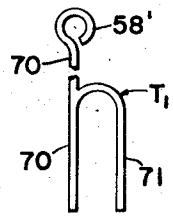


FIG. 10.

FIG. 9.



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United States Patent Office 2,894,264 Patented July 14, 1959

2,894,264

FLUSH VALVE GUIDES

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Application October 31, 1955, Serial No. 543,921

5 Claims. (Cl. 4—57)

This invention relates to flush valves, and more particularly to flush valves which are useful in flush tanks of a toilet.

The construction of flush valves for toilet tanks has become substantially standardized through the last several decades. In general, such flush valves have comprised a ball mounted on the lower end of a rod which is pulled upwardly by a lever attached to a crank or handle mounted exteriorly of the water compartment, the ball being adapted to seat in the outlet opening to stop the flow of water, when the water compartment has emptied through the outlet opening. The rod normally extends through a ring which is mounted on the outer end of a bracket clamped to an over flow pipe, through which a small amount of water is fed continuously through the outlet by a separate passage while the tank is filling, the flow of water into the water compartment and also into the overflow pipe being controlled by a valve which is responsive to the position of a float in the water compartment. The upper end of such rods have been connected to the lever by wire links, chains or even directly connected. Also, such balls are normally formed of rubber and are hollow, some having an opening on the underside of a smaller diameter than the outlet so that air will be trapped within the ball. When the handle is actuated, the ball is pulled upwardly from the outlet and, if not pulled thereto, tends to float to a position at the level of the water, which level falls as the water compartment empties. Theoretically, when the water level in the compartment reaches the top of the outlet, the ball will reseat in the outlet, thus stopping the main discharge of water from the compartment. In the meantime, the float will drop with the water level so as to open the intake valve, which is normally adjusted so as to supply water at a slower rate than the principal discharge thereof. Thus, when the ball seats, the water compartment or tank will begin to fill and when the float reaches a predetermined upper position, the intake valve will be closed. Such construction, particularly after some period of use, suffers from the disadvantage that the ball may not seat properly in the outlet, so that a continuous flow of water is permitted, thus producing not only a waste of water but also an objectionable noise due to the continued flow of water through the intake valve. In the event that the misalignment of the ball is particularly pronounced, the water compartment or tank may not even fill properly, so that there is insufficient water in the tank for the next flushing operation. While balls eventually wear out, often misalignment and other difficulties occur long before the serviceable period of the ball is ended. Such misalignment may be due to the bracket for the ring, through which the ball rod extends, becoming dislodged or accidentally moved to a position off center with respect to the outlet, but often is also caused by wave motion or other disturbances in the tank produced by the filling operation or by water swirling into the outlet as the water level drops thereto. When water at a considerable pressure flows into the tank, strong currents

and agitation of the water are produced, or by the aforesaid swirling motion, which may cause the ball to be moved to a position considerably off center, with respect to the outlet, so that when it finally drops to its lowermost position, it will not seat properly.

Among the objects of the present invention are to provide a novel flush valve particularly adapted for toilet tanks; to provide such a flush valve which will seat properly, irrespective of water currents or agitation by incoming or outgoing water; to provide such a flush valve which may be made in several different forms; to provide in each such form dependable guiding movement for the ball or valve to the outlet; to provide different forms of flush valve in which different materials may be utilized; to provide each of the several different forms which will be seated accurately over a long and useful period of time; to provide certain such forms which are particularly adapted to be utilized in new installations; to provide other such forms which may be applied to old installations; and to provide in each of the several different forms, flush valves which may be readily manufactured and easily installed.

The foregoing and additional objects of this invention, as well as the novel features thereof, will become apparent from the description which follows, taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view of a flush valve constructed in accordance with this invention and certain associated parts;

Fig. 2 is a vertical section, on an enlarged scale, of the flush valve of Fig. 1;

Fig. 3 is a top plan view of a guide support which may be utilized in the flush valve of Fig. 1;

Fig. 4 is a side elevation of a special tool which may be utilized in installing the guide support of Fig. 3;

Fig. 5 is a plan view of a guide support which may be utilized in the construction of Fig 1 and alternative to that of Fig. 3;

Fig. 6 is a fragmentary vertical section of an alternative flush valve construction;

Fig. 7 is a fragmentary plan view, looking downwardly from the position of line 7—7 of Fig. 6 and within the ball thereof;

Fig. 8 is a top plan view of a guide support of the construction of Fig. 6;

Fig. 9 is a side elevation of a special tool, alternative to that of Fig. 4; and

Fig. 10 is a side elevation of a special tool which may be utilized in installing the guide support of Fig. 8 and which is alternative to the tools of Figs. 4 and 9.

A flush valve constructed in accordance with this invention may be utilized with an outlet fitting F, as illustrated in Figs. 1 and 2. The outlet fitting F of Figs. 1 and 2 is adapted to be installed in a conventional water compartment and may include a cylindrical outlet **10** having a beveled seat **11** at the upper end and provided on the lower portion of the outside with threads **12**, the bottom of the water compartment being provided with a hole through which outlet **10** extends. At one side, the fitting F may be provided with a conventional hollow flange **13** having a passage **14** leading to the outlet **10** and adapted to receive an overflow tube **15**, through which a small amount of water is discharged while the water compartment is being filled. Around its exterior and just beneath flange **13**, outlet **10** may be provided with a flange **16** by which a gasket or other suitable sealing device may be clamped against the bottom of the water compartment by a conventional nut (not shown) which engages threads **12**. Threads **12** also permit the attachment of the fitting to a bowl in a conventional manner.

A flush valve constructed in accordance with this in-

vention, as illustrated in Figs. 1 and 2, may include a lower guide L and an upper guide and stop U, adapted to insure that the valve, such as a ball B, will seat properly on the seat 11. The ball B may be moved upwardly in a conventional manner, as by a chain 17, the upper end of which may be attached to a conventional lever 18, as at one of several holes 19. The lower guide L includes an upright rod 20 which is held in fixed position centrally of the outlet 10, as by the support of Figure 3.

Ball B may be similar to a conventional type of ball, i.e., provided with downwardly tapering, frusto-conical sides 34 and a slanted top 35 provided at its center with an upwardly and downwardly extending, hollow boss 36, for a purpose described later. A flat bottom 37 of the ball may extend inwardly from the lower edges of sides 34 and be provided with a central hole 38. Ball B may be molded from rubber or any other suitable material, with all of the parts thereof formed integrally, as shown, or formed separately and vulcanized or otherwise suitably attached to each other. Preferably, the material of which ball B is made is sufficiently flexible that the sides 34 will be resilient and will tend to engage the seat 11 to form a liquid-tight seal with the ball in closed position.

The upper guide U may include an arcuate guide strip 40 which forms a loop open at one side, preferably towards the overflow tube 15, so that ball B and the associated parts may be readily placed in position. The strip 40 may be integral with or provided with a ring clamp 41, adapted to surround tube 15 and be clamped thereon, as by a bolt 42, or by a thumb screw or the like. Attached to ball B is a tube 43, which may be made of metal but preferably of plastic, having a closed, transversely flattened upper end 44 which is provided with a transverse hole 45, through which a ring 46 may be inserted for connection to chain 17. At spaced positions adjacent its lower end, tube 43 may be provided with outwardly extending, circumferential flanges 47 and 48, respectively, to provide a groove which receives the boss 36 provided at the center of top 35 of ball B. Due to the engagement of boss 36 in the groove between flanges 47 and 48, the ball B is not adjusted upwardly or downwardly along tube 43, so that variations between different installations may be accommodated by adjustment of chain 17.

The upright rod 20 cooperates with tube 43 to insure that ball B will move generally downwardly along the axis of outlet 10, in the event that the ball B tends to be moved to one side while moving downwardly, although the clearance between rod 20 and tube 43 is preferably such that the ball B may tip slightly upon seating, if necessary. Thus, rod 20 and tube 43 insure that ball B will be guided accurately to a generally centered position relative to outlet 10. Also, guide strip 40 of the upper guide U is preferably positioned at an elevation such that during upward movement of ball B, tube 43 will be prevented from slipping off rod 20. Tube 20 may be mounted on a removable support, which is adapted to be placed in outlet fitting F, such as already in use or manufactured in the more conventional manner. Thus, rod 20 may extend upwardly from a central clamping ring 50, from which flanges 51 extend in side by side relation to generally arcuate arms 53, the outer ends of which terminate in hooks 54 to facilitate insertion and placement, as in a fitting already in use. The normal position of arms 53 may be as shown in full in Fig. 3, while the position after installation is shown in dotted lines. The central ring 50, flanges 51 and arms 53 may be conveniently formed from a single flat strip of resilient metal, so that arms 53 will press outwardly against the inside of fitting F when installed. In addition, prior to installation, arms 53 may be pressed inwardly and a tool T inserted in hooks 54 to retain arms 53 in the dotted positon of Fig. 3 until the lower guide L reaches a suitable position, whereupon the tool may be removed so that arms 53 may spring outwardly and hold rod 20 securely in position. After the lower guide L is installed, tube 43 with chain 17

connected thereto, may be inserted over rod 20, after which strip 40 may be adjusted in position, such as approximately the level of the top of rod 20.

The tool T, as illustrated in Fig. 4, may be formed from a single length of wire or other suitable material, formed to shape to provide lower spaced prongs 56, a central twisted section 57 and a handle loop 58 at the upper end, the latter of which may be bent over into a horizontal plane or left upstanding, as desired. As will be evident, the prongs 56 are adapted to be inserted in hooks 54 of the lower guide L when in compressed position, and the lower guide then inserted in the fitting, after which the tool may be pulled from the lower guide by pulling upwardly on the handle 58, while the lower guide is held in position, as by grasping rod 20.

The lower guide L_2 of Fig. 5 may be utilized in lieu of lower guide L of Fig. 3. Thus, a rod 20', which is otherwise similar to rod 20, may be threaded at its lower end into a boss 21 at the inner end of an arm 22, which extends inwardly from a ring 68 which is formed of resilient metal and is adapted to press outwardly against the inner wall of outlet 10, so as to hold rod 20' securely in position. For greater ease in installation, the ends of ring 68 may be separated slightly and provided with loops 69 for insertion of an installation tool, such as tool T of Fig. 3 or tool T_1 of Fig. 9. Also, arm 22 may be formed integrally with or may be attached, as by welding, brazing, or in any other suitable manner, to ring 68 opposite the position of hooks 69.

When utilizing the tool T of Fig. 3 to install the lower support L_2 of Fig. 5, the opposite sides of ring 68 are pushed inwardly, such as until loops 69 reach the dotted position of Fig. 5, whereupon the prongs 56 of tool T may be inserted in the loops 69 and the lower guide L_2 placed in position in the outlet fitting. Then, the guide may be maintained in that position, as by holding rod 20' steadily with one hand, and tool T then removed, so that ring 68 will expand outwardly to press firmly against the inside of outlet 10. The tool T_1 of Fig. 9 may be used in a similar manner, such tool including a stem 70, the lower end of which forms one prong and to which is attached a second prong 71, as by welding, brazing or the like, with the upper end of stem 70 being formed as a handle loop 58', or in any other suitable manner, so that the tool may be grasped conveniently.

In the embodiment of Figs. 6–8, a special ball B_2 may be utilized in conjunction with a lower guide L_3, the device being installed in an outlet fitting similar to the fitting F of Figs. 1 and 2. The ball B_2 may have tapered sides 34 forming an inverted frusto-conical seating element adapted to engage the seat formed at the top of the outlet fitting and may also be provided with a conical top 73, although the top may have any other desired configuration. Top 73 may be provided at its apex with a boss 74 into which an eye 32 may be threaded, an interiorly threaded metal ferrule conveniently being embedded in boss 74, if desired. Eye 32 permits attachment of an actuating chain or the like, such as chain 17 of Fig. 1.

From the lower periphery of sides 34 of ball B_2, a circumferential flange 75 extends inwardly for engagement with a correspondingly shaped groove in the outer periphery of a disk 76, the latter preferably being formed of plastic or other suitable material and ball B_2 being made of rubber or other material which has sufficient reseilience that the opening at flange 75 can be stretched to permit flange 75 to be worked into the groove in disk 76. Disk 76 is provided with one or more slots 77 to provide small openings so that air may be trapped within ball B_2 to permit it to rise more readily when the valve is opened. Ball B_2 is guided primarily by a stem 78, the upper end of which may be threaded into the center of disk 76 and which may be locked in position by a lock nut or in any other suitable manner, it being noted that when disk 76 is made of plastic, threads on rod 78, when made of metal, will ordinarily form a sufficiently tight

engagement with the plastic that rod **78** will not tend to become loosened. The lower end of rod **78** may be provided with a hook **79**, which limits the upward travel of ball B_2, in a manner described later.

The lower guide L_3 may be somewhat similar to the lower guide L_2 of Fig. 5, except that rod **78** is movable in a hole **80** formed in a boss **21'** at the inner end of an arm **22'**, rather than the guide rod being attached thereto in fixed position, as in Fig. 5. Thus, arm **22'** may be integral with, but is preferably formed separately from, and attached to a ring **68'**, formed of resilient metal in the form of a flat strip and the free ends of which are provided with loops **69** for cooperation with a suitable tool, such as the tool T of Fig. 4, the tool T_1 of Fig. 9, or the tool T_2 of Fig. 10. The lower guide L_3 is placed in position in the fitting in the same manner as the removable guides described previously, i.e., by compressing the sides of ring **68'** and inserting the prongs of the tool in the loops **69**. For installation of the embodiment of Figs. 6–8, ball B_2 may be disconnected from disk **76** to provide operating space and clearer vision, whereupon lower guide L_3 may be placed in a position, such as so that the hook **79** will abut against the underside of boss **21'** when ball B_2 is at its uppermost desired position, it being noted that lower guide L_3 must be placed sufficiently within the outlet that the sides **34** of ball B_2 will seat adequately. After the tool has been removed and ring **68'** springs out, flange **75** of ball B_2 may be worked into the groove in disk **76** with the chain or similar means for pulling the ball upwardly then or previously attached to eye **32**, whereupon the device is ready for use. As will be evident, rod **78** will guide ball B_2 with sufficient accuracy to its seat, although hole **80** should provide a slight clearance not only to permit greater freedom of movement, but also to permit ball B_2 to tip slightly as it seats. One of the advantages of the embodiment of Figs. 6–8 is the ease with which a single lower guide L_3 may be installed and the ease with which ball B_2 may be connected to disk **76**. In addition, disk **76** prevents the rod **78** from dropping through the supporting structure during installation thereof.

The tool T_2 of Fig. 10 may be provided with a central stem **70'** having a loop handle **58'** at its upper end and a pair of prongs **71'** extending in axially spaced relation and downwardly from stem **70'**. Prongs **71'** may be formed from a single piece of metal and then welded, brazed or attached in any other suitable manner to the lower end of stem **70'**, or tool T_2 may be forged or otherwise shaped from a single piece of metal.

As will be evident, the lower guide L of Fig. 3 may be used in conjunction with the rod **78** of Fig. 6, as by merely forming the central ring **50** so as to have a sufficient diameter to permit rod **78** to move readily therethrough. The upper guide U of Fig. 1 also may be utilized in the form shown in Fig. 6, to limit upward movement of ball B_2 so that rod **78** cannot slip out of the lower guide upon upward movement of the ball. When the upper guide U is so used, the hook **79** at the lower end of rod **78** may be omitted.

From the foregoing, it will be evident that a flush valve constructed in accordance with this invention fulfills to a marked degree the requirements and objects hereinbefore set forth. In each of the embodiments illustrated and described, it will be evident that the valve or ball will tend to seat properly irrespective of water currents or agitation by water. It will also be evident that the valve or ball is guided accurately during both upward and downward movement in each of the embodiments. Although different embodiments of this invention have been illustrated and described, it will be understood that other embodiments may exist and numerous variations made therein, all without departing from the spirit and scope of this invention.

What is claimed is:

1. In a flush valve and the like for a water compartment provided with a fitting having an outlet and a seat, valve means cooperating with said seat and movable upwardly from said seat and downwardly to said seat, and means including a rod for guiding said valve means to and from said seat, the improvement comprising a device for maintaining said rod in a central position relative to said outlet and including a resilient ring-shaped member in flat strip form having spaced ends on one side so as to be open at said side and adapted to engage the inner surface of said outlet, said member having a hook at each end for engagement by a tool for inserting the same; and means extending inwardly from the side opposite said open side for engagement with said rod at a position centrally of said outlet.

2. In a flush valve and the like for a water compartment provided with a fitting having an outlet and a seat, an overflow tube connecting with said outlet and valve means cooperating with said seat and movable upwardly from said seat and downwardly to said seat, the improvement comprising a guide rod; means for mounting said guide rod in upwardly extending position and centrally of said outlet fitting, said rod mounting means including a resilient ring having ends on one side so as to be open at said side and adapted to engage the inner surface of said outlet, said ring having means at each end for engagement by a tool for inserting said ring in said outlet, and means extending inwardly from the side opposite said open side for attachment to said rod at a position centrally of said outlet; a sleeve having a closed upper end and an open lower end, said sleeve normally surrounding said rod, relative movement between said sleeve and said rod producing an upward and downward guiding movement; said valve means including a hollow ball formed of resilient material and having inclined sides and a top, said top having a central aperture through which said sleeve extends and said ball bottom having a hole through which at least said rod extends, said sleeve having longitudinally spaced circumferential flanges adjacent the lower end thereof providing a groove for receiving the upper end of said ball at said aperture; means mounted on said overflow tube, including a ring at least partially surrounding said sleeve, for limiting upward movement of said ball; and means attached to the upper end of said sleeve for lifting said sleeve and said valve means.

3. In a flush valve and the like for a water compartment provided with a fitting having an outlet and a seat, the improvement defined in claim 5, wherein said valve means comprises a hollow ball valve formed of resilient material and having tapering sides and a flange extending inwardly from the lower end of said sides, said flange surrounding an aperture; and a disc having a peripheral groove for receiving said flange and provided with holes therethrough; said guide rod being attached to said disc and extending downwardly therefrom.

4. In a flush valve and the like for a water compartment provided with a fitting having an outlet and a seat, valve means cooperating with said seat and movable upwardly from said seat and downwardly to said seat, and means including a rod for guiding said valve means to and from said seat, the improvement comprising a device for maintaining said rod in a central position relative to said outlet and including a generally ring-shaped member of resilient material in the form of a flat strip, the ends of which are spaced apart to provide an opening at one side and having a central ring for receiving said rod; a pair of flanges extending in side by side relation radially outwardly from said ring; generally arcuate arms extending circumferentially in opposite directions from the outer ends of said flanges to said ends which are disposed on the same side of said ring-shaped member; and at least a portion of each end extending inwardly to form a hook for engagement by a tool for inserting said device in said fitting outlet.

5. In a flush valve and the like for a water compartment provided with a fitting having an outlet and a seat,

valve means cooperating with said seat and movable upwardly from said seat and downwardly to said seat, and means including a rod for guiding said valve means to and from said seat, the improvement comprising a device for maintaining said rod in a central position relative to said outlet and including a resilient ring in flat strip form having spaced ends on the same side to provide an opening at said side, at least a portion of each said end extending inwardly to provide a hook for engagement by a tool for inserting said device in said fitting outlet; and a single arm extending radially inwardly from and attached to said ring on the side opposite said opening and provided at its inner end with means for engaging said rod.

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