

June 11, 1963

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3,093,156

REMOVABLE FLOODING CONTROL PLUG

Original Filed Sept. 16, 1957

2 Sheets-Sheet 1

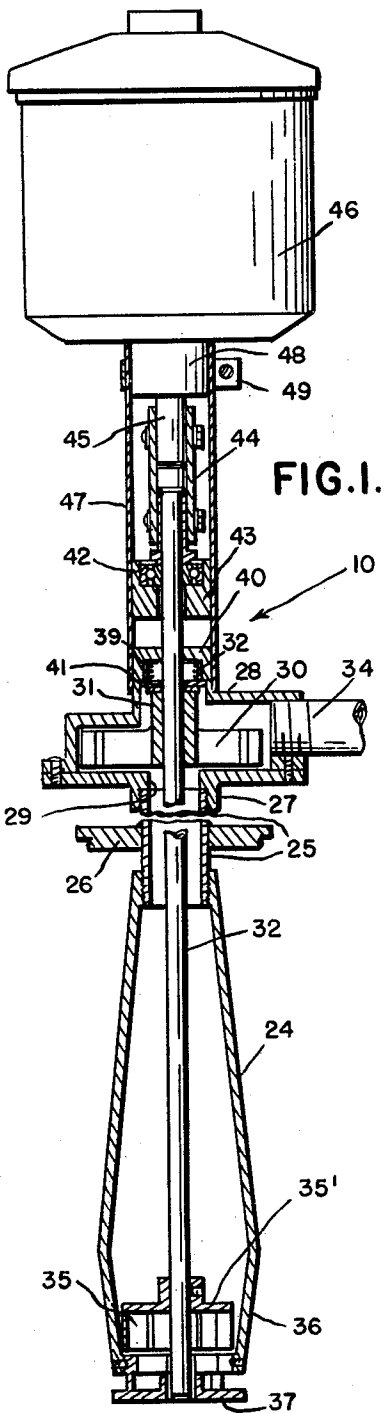


FIG. 1.

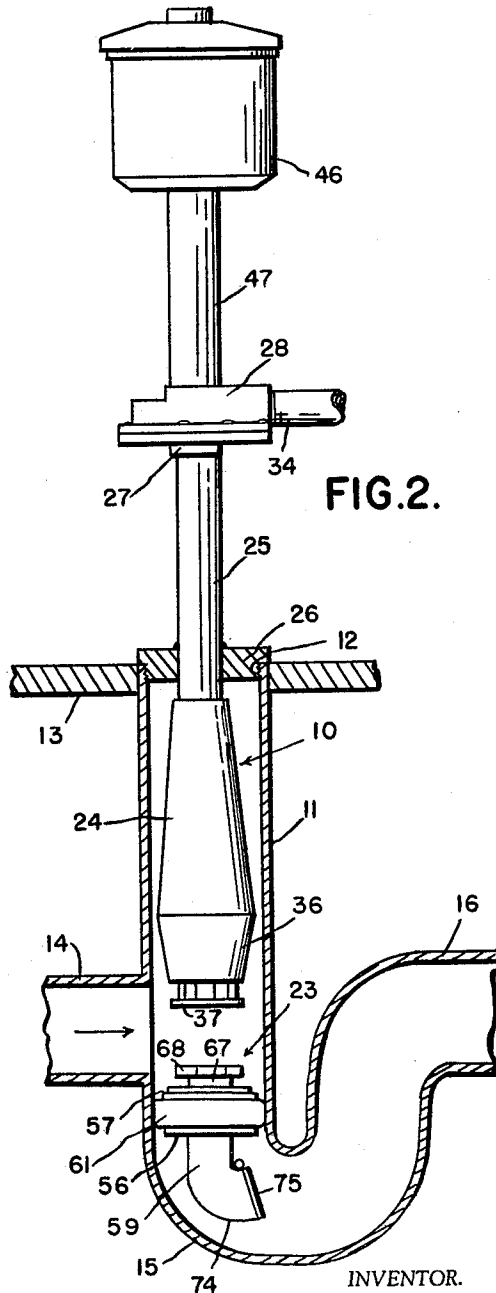


FIG. 2.

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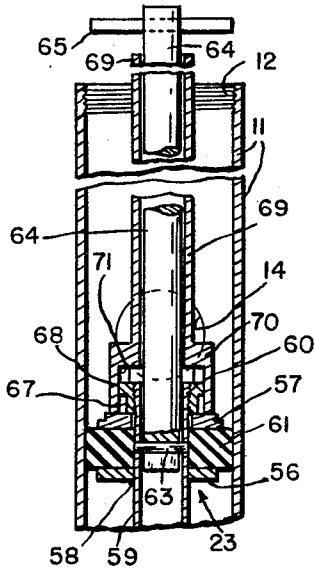


FIG. 3.

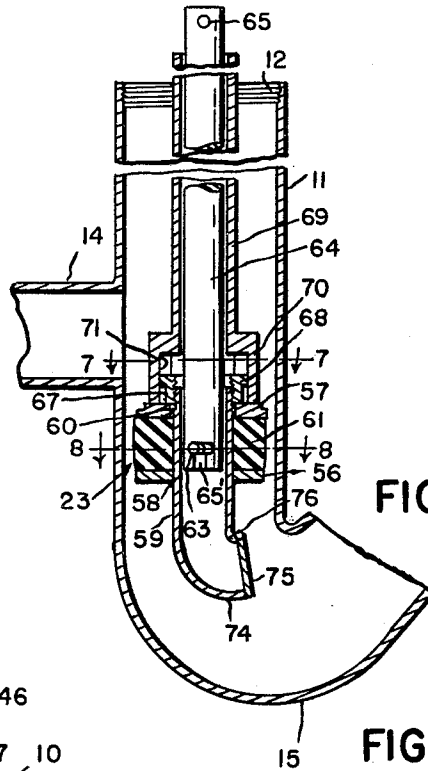


FIG. 4.

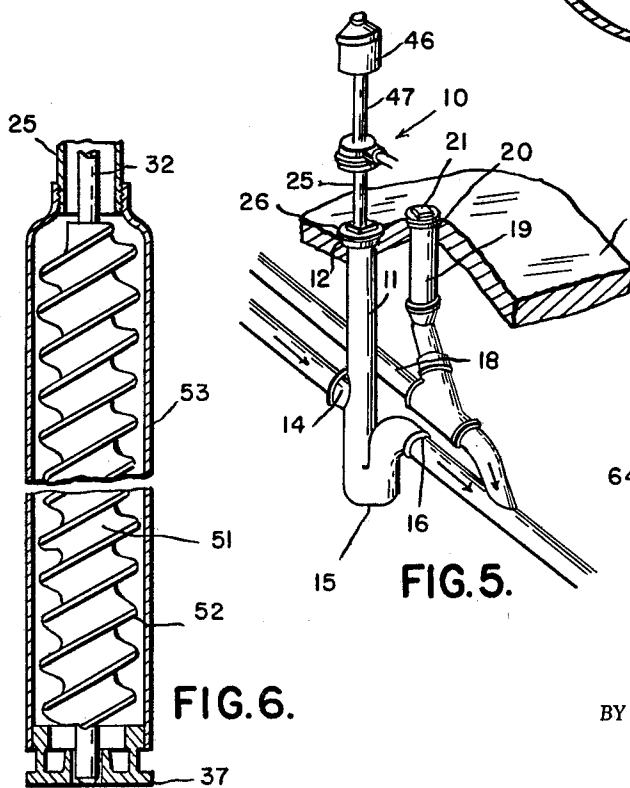


FIG. 5.

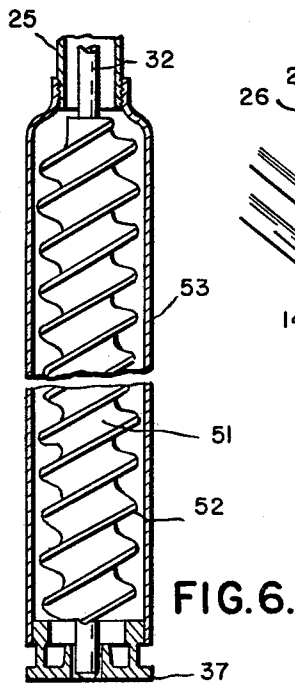


FIG. 6.

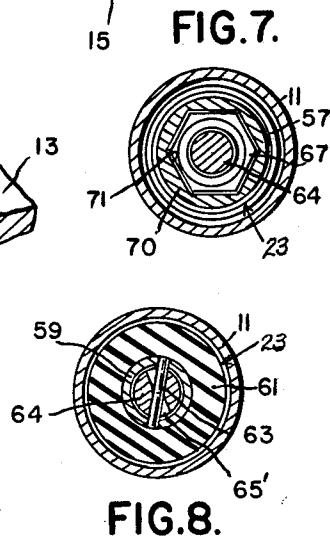


FIG. 7.

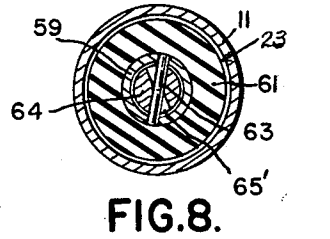


FIG. 8.

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3,093,156

REMOVABLE FLOODING CONTROL PLUG

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Original application Sept. 16, 1957, Ser. No. 684,308.

Divided and this application Nov. 16, 1959, Ser. No. 853,243

10 Claims. (Cl. 137—328)

The present invention relates generally to improved apparatus for flood control in the event of overloading of a municipal or other sewer system. More particularly, the improvement relates to a sealing and anti-backflow closure and control plug unit for a basement or other type floor riser which is very compact, though effective, and simple, and readily and quickly installed in the riser. The present application is a division of my copending application, Serial No. 684,308, filed September 16, 1957, and entitled "Flooding Control and Pump System," since abandoned.

It is a general object of the invention to provide an improved riser seal-off and backwater control plug capable of use in flood control assembly such as is disclosed in that application, featuring, firstly, a self-contained and self-priming double pump unit, although the use of the plug is by no means thus limited. However, in such a setting the control plug is usually positioned in a floor riser or the like beneath the entrance of the usual storm drain line to the usual riser and trap. The pump unit is then inserted in the riser above the plug and is driven by a motor positioned above its main impeller housing, which is above the floor in which the riser opens. As shown in my application identified above, the main impeller housing has its intake in downward communication with the housing of a further primer pump disposed in the riser.

More specifically, it is an object to provide such an improved and simplified anti-backflow sealing and control plug unit, for general use or for use in combination with a pump unit of the foregoing character, including an expansible sealing plug and a one-way check valve preventing back-flooding from the sewer to the riser clean-out opening, or to drain.

To this end, the one-way control plug specifically includes a resilient sleeve-like plug element adapted to be manually expanded to block off the riser at a water seal level adjacent its trap, with a check valve-controlled tubular housing or passage extending through the sleeve element for the unimpeded flow of water into the sewer, without reverse back-flow from the sewer. Thus, when used in assembly with a pump unit, any water accumulating above the one-way valved control unit is pumped upwardly by the pump unit above the floor level, from which point it can be disposed of by returning to the sewer line or by discharge to the exterior of the dwelling.

A still further object is to provide a seal or plug unit of the character described which is equipped with improved and simplified means for manually inserting and positioning the same in the basement clean-out opening, such means being detachable from the plug unit, once it is so inserted and positioned.

The foregoing, as well as other objects, will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawings illustrating the invention, wherein:

FIG. 1 is a fragmentary view in vertical axial section,

partially broken away, of a pump unit according to my above-identified application, in combination with which the improved plug may be used;

FIG. 2 is a fragmentary, elevational view showing the plug and pump units as operatively installed in relation to a sub-floor riser and storm drain and sewer line;

FIGS. 3 and 4 are like views in vertical axial section, at 90° to one another, through the improved valved control plug of the invention, with the plug in operative, expanded and inoperative, contracted positions, respectively, the figures also showing suitable simple tools for inserting and positioning this unit;

FIG. 5 is a fragmentary perspective view generally illustrating the installation of the improved system of my copending application in relation to a basement floor and sub-floor storm drain and sewer lines or conduits;

FIG. 6 is a fragmentary view in axial section through an alternative form of priming device adapted to be associated as a component of a pump unit with the subject plug; and

FIGS. 7 and 8 are, respectively, views in horizontal section on lines 7—7 and 8—8 of FIG. 4.

Referring first to FIG. 5 of the drawings, the reference numeral 10 generally designates the improved self-priming pump unit claimed in my copending application, as installed in an upright riser or standpipe 11, or equivalent water accumulator, having a clean-out opening 12 disposed only slightly above a basement floor surface 13, as in a typical domestic installation. The usual storm drain or seepage line 14 opens to this riser somewhat above its trap 15 which discharges at 16 to the city sewer. The usual sanitary system of the installation, from tubs, sinks, toilets and the like, as typified by the sanitary line 18 equipped with a riser 19 and clean-out opening 20 fitted with a closure plug 21, discharges to the sewer downstream of the trap.

The reference numeral 23 (FIGS. 2, 3, 4, 7 and 8) generally designates the improved valved sealing and anti-backflow unit of the invention, in the form of an expansible backwater control plug having novel anti-flood check valve provisions, as well as improved means for inserting, positioning and removing the unit 23, all to be described. Referring first to FIGS. 1 and 2, the pump unit 10 comprises a vertically elongated priming housing 24 of tapering frusto-conical cross section. The upper opening of this housing threadedly receives a nipple-like tubular connector 25 of desired length, which has a mounting disk or plug 26 fixed thereon above the housing 24. Disk 26 threads into the clean-out opening 12 of riser 11, normally occupied by the usual closure plug.

Tubular connector 25 is threaded at its upper end into an axial boss 27 of the special pump housing 28, the hub 27 surrounding the intake eye 29 to a centrifugal impeller 30 in this housing. Impeller 30 has its hub 31 fixed on an elongated driveshaft 32 extending downwardly and coaxially through the primer housing 24. The latter may be of, say, 3½ inch maximum diameter for installation in a four inch pipe riser.

Pump housing 28 discharges laterally above floor level 13 at 34, where it may be return-connected to the sanitary line riser 19, or it may be connected to discharge to the exterior of the dwelling or other building in question.

A centrifugal priming impeller 35 featuring a top shroud disk or plate 35' is secured to the shaft 32 adjacent the lower end thereof, within a downwardly tapered conical

bottom portion 36 of primer housing 24. This end of the shaft may be appropriately journalled in a fixed intake trap 37 secured beneath housing 24, through which liquid enters to the blading of impeller 35 from the storm drain line 14.

The upward divergence of the tapered lower housing portion 36 and the top shrouding of impeller 35 at 35' considerably assist the latter in obtaining a rapid initial lift of water, which is then further speeded to housing 28 by the upward convergence of the housing 24 above impeller 35.

A suitable axially acting, spring urged rotary seal 39 is interposed between the upper end of the discharge impeller hub 31 and a hollow top extension 40 of centrifugal pump housing 28, the seal preferably including a carbon seal disk 41 to contain upward flow at this point.

Drive shaft 32 is appropriately journalled by a ball bearing 42 in a cylindrical mounting block 43 upwardly of pump housing 28, and the upper end of shaft 32 is connected by an appropriate coupling 44 with the depending shaft 45 of an electric drive motor 46, suitably wired in a conventional way. Motor 46 may be automatically controlled by a sump pump type of control unit such as is illustrated and described in my Letters Patent No. 2,834,845 of May 13, 1958.

The shaft sealing, bearing and coupling provisions just described are encased in a tubular motor mounting housing and sheath 47, which is clamped about a motor boss 48 at its top, a clamp for this purpose being designated 49, and is force-fitted about the axial housing extension 40 at its bottom.

An alternative form of priming structure is illustrated in FIG. 6 of the drawings. This includes an axially disposed screw type impeller 51, the continuous helical land 52 of which is connected to the motor drive shaft 32. A cylindrical priming housing 53 encases impeller 51, which acts to lift water rapidly to prime the main or above-floor pump housing 28, as in the first embodiment. Corresponding parts in the two embodiments are correspondingly numbered.

Referring now to FIGS. 3 and 4 in conjunction with FIG. 2, the one-way control plug or sealing unit 23 is comprised of a pair of centrally apertured, lower and upper metal disks 56, 57, respectively, the lower disk 56 surrounding and being rigidly secured, as by threading or welding at 58, to an upright tubular valve housing 59. The upper disk 57 is slidably engaged over an upper threaded extremity 60 of the tubular member 59; and an annular, axially compressible sealing ring 61 of rubber, synthetic rubber, or like resiliently deformable material occupies the space between the disks 56, 57.

Accordingly, it is seen that, with the unit 23 first located beneath the level of the storm drain line 14, the exertion of downward axial force on the upper disk 57 causes ring 61 to be radially expanded from its normal inoperative, contracted position of FIG. 4 to its operative expanded, sealing position of FIG. 3. In this condition it seals peripherally against the wall of the riser 11 to prevent back flooding or seepage from the sewer past the periphery of unit 23.

For the purpose of initially disposing the plug unit 23 in this position, the tubular housing 59 is equipped with a fixed internal cross pin 63, manually engageable by an elongated inserting and removing tool or rod 64 (FIG. 4). This tool is equipped with a hole adapted to receive a hand piece 65 at its top and is appropriately devised at its lower end to enable the unit 23 to be both lifted and lowered in the pipe 11, having a downwardly opening bayonet type slot 65' at its bottom to positively engage pin 63 both from above and below, thus to lift and lower plug 23, as well as prevent rotation of the latter, as will be described.

For the purpose of exerting axial force on disk 57 to expand the resilient plug sleeve 61, a hex-headed actuating member or collar 67 is mounted in threaded engage-

ment with the upper extremity 60 of tubular valve housing 59. The hexagonal nut head 68 of collar 67 is adapted to be non-rotatively engaged by the second, expanding and contracting tool 69, which is of open-ended tubular nature.

Tool 69 has an internal diameter enabling it to be slipped axially over the rod-like tool 64, being sufficiently shorter than the latter to enable the hand piece 65 to be applied above tool 64 when all parts are properly engaged. The lower end of tubular tool 69 is considerably enlarged to provide a nut head 70 which has a hexagonal internal cross section at 71 to fit over the hex head 68 of collar 67.

Thus with the tool 64 engaged with pin 63 to suspend plug 23 and prevent its rotation, and with the hexagonal interior 71 of tool 69 engaged on collar nut head 68, the latter tool may be manually rotated to exert the desired axial thrust on disk 57, and thus expand the resilient member 61 to sealing engagement with housing 59.

The tubular housing 59 has a bottom outlet extremity 74 which is curved and disposed to face in the direction of the city sewer line, as illustrated in FIGS. 2, 3 and 4, and an anti-backflow flap or check valve 75 is pivoted on an upper horizontal axis 76 at the open mouth of this extremity. Thus reverse flow from the sewer line upon its overloading and flooding is prevented, yet normal proper flow through the valve housing 59 in the direction of the sewer is unimpeded at all times.

During a flood condition, the sewer back pressure on flap valve 75 holds the same closed, so that seepage water entering the interior of the plug from line 14, will be denied outlet past valve 75, and hence will accumulate and may be pumped upwardly through the riser and voided.

The invention provides an improved anti-backflow, valved sealing plug unit 23, which may be employed separately or jointly with a pump unit to prevent flooding from a sewer. The plug is rapidly and easily mounted and removed from its riser position, and is very efficient in performing its anti-backflow function.

What I claim as my invention is:

1. A plug unit for flow control apparatus adapted to be removably positionable downwardly in a basement or like upright riser, said plug unit including a resilient annular sealing member which is expansible radially outwardly for sealing engagement with said riser, a tubular member of substantial axial length extending coaxially downwardly into said sealing member with its exterior is sealed relation to the latter, thus to provide a flow passage through the unit when the sealing member is engaged with the riser, an annular actuating member threadedly engaging said tubular member circumferentially thereof, an annular thrust member surrounding said tubular member and adapted to transmit axial thrust to said sealing member from said actuating member, said tubular and thrust members having radially outwardly extending portions thereon engaging and compressing said sealing member in the axial direction therebetween to expand the sealing member radially upon relative threading adjustment of the tubular and actuating members, said actuating member compressing said sealing member from above through the agency of said thrust member and being provided with a formation above the latter which is releasably engageable by a tool for the rotation of said actuating member for said threading adjustment, said tubular member having a fixed element positioned cross-wise and internally thereof which is releasably engageable by a tool to move said unit downwardly and upwardly in the riser, as well as to restrain said tubular member upon relative rotation of the actuating member, said last named element affording means to support said plug unit for vertical adjustment in said riser, said tubular member having means to prevent reverse flow through said flow passage.

2. A plug unit for flow control apparatus adapted to be removably positionable downwardly in a basement or like upright riser, said plug unit including a resilient annular

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sealing member which is expansible radially outwardly for sealing engagement with said riser, a tubular member of substantial axial length extending coaxially downwardly into said sealing member with its exterior in sealed relation to the latter, thus to provide a flow passage through the unit when the sealing member is engaged with the riser, an annular actuating member threadedly engaging said tubular member circumferentially thereof, an annular thrust member surrounding said tubular member and adapted to transmit axial thrust to said sealing member from said actuating member, said tubular and thrust members having radially outwardly extending portions thereon engaging and compressing said sealing member in the axial direction therebetween to expand the sealing member radially upon relative threading adjustment of the tubular and actuating members, said actuating member compressing said sealing member from above through the agency of said thrust member and being provided with a formation above the latter which is releasably engageable by a tool for the rotation of said actuating member for said threading adjustment, said tubular member having a fixed element positioned cross-wise and internally thereof which is releasably engageable by a tool to move said unit downwardly and upwardly in the riser, as well as to restrain said tubular member upon relative rotation of the actuating member, said last named element affording means to support said plug unit for vertical adjustment in said riser, said flow passage having a mouth opening substantially radially of said tubular member at the bottom of the latter, and a valve pivotally mounted on said tubular member adjacent said flow passage and gravitationally biased to close said mouth and prevent reversing flow through said flow passage.

3. The combination with a plug unit as described in claim 1 of a tubular tool releasably engageable in said riser with said formation of said actuating member for the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said cross-wise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coaction with said first named tool in the compression of said sealing member.

4. The combination with a plug unit as described in claim 1 of a tubular tool releasably engageable in said riser with said formation of said actuating member for the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said crosswise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coaction with said first named tool in the compression of said sealing member, said further tool having means at the bottom thereof for a releasable bayonet and slot-type engagement with said element.

5. The combination with a plug unit as described in claim 2 of a tubular tool releasably engageable in said riser with said formation of said actuating member for the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said crosswise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coaction with said first named tool in the compression of said sealing member.

6. The combination with a plug unit as described in claim 2 of a tubular tool releasably engageable in said riser with said formation of said actuating member for the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said crosswise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coacting with said first named tool in the compression of said sealing member, said further tool having means at the bottom thereof for a releasable bayonet and slot-type engagement with said element.

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7. A plug unit for flow control apparatus adapted to be removably positionable downwardly in a basement or like upright riser, said plug unit including a resilient annular sealing member which is expansible radially outwardly for sealing engagement with said riser, a tubular member of substantial axial length extending coaxially downwardly into said sealing member with its exterior in sealed relation to the latter, thus to provide a flow passage through the unit when the sealing member is engaged with the riser, thrust means including an annular actuating member threadedly engaging said tubular member circumferentially thereof, said tubular member and thrust means having portions engaging and compressing said sealing member in the axial direction therebetween to expand the sealing member radially upon relative threading adjustment of the tubular and actuating members, said actuating member being provided with a formation which is releasably engageable by a tool for the rotation of said actuating member for said threading adjustment, said tubular member having a fixed element positioned cross-wise and internally thereof which is releasably engageable by a tool to move said unit downwardly and upwardly in the riser, as well as to restrain said tubular member upon relative rotation of the actuating member, said last named element affording means to support said plug unit for vertical adjustment in said riser, said tubular member having means to prevent reverse flow through said flow passage.

8. A plug unit for flow control apparatus adapted to be removably positionable downwardly in a basement or like upright riser, said plug unit including a resilient annular sealing member which is expansible radially outwardly for sealing engagement with said riser, a tubular member of substantial axial length extending coaxially downwardly into said sealing member with its exterior in sealed relation to the latter, thus to provide a flow passage through the unit when the sealing member is engaged with the riser, thrust means including an annular actuating member threadedly engaging said tubular member circumferentially thereof, said tubular member and thrust means having portions engaging and compressing said sealing member in the axial direction therebetween to expand the sealing member radially upon relative threading adjustment of the tubular and actuating members, said actuating member being provided with a formation which is releasably engageable by a tool for the rotation of said actuating member for said threading adjustment, said tubular member having a fixed element positioned cross-wise and internally thereof which is releasably engageable by a tool to move said unit downwardly and upwardly in the riser, as well as to restrain said tubular member upon relative rotation of the actuating member, said last named element affording means to support said plug unit for vertical adjustment in said riser, said flow passage having a mouth opening substantially radially of said tubular member at the bottom of the latter, and a valve pivotally mounted on said tubular member adjacent said flow passage and gravitationally biased to close said mouth and prevent reversing flow through said flow passage.

9. The combination with a plug unit as described in claim 7 of a tubular tool releasably engageable in said riser with said formation of said actuating member for the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said cross-wise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coaction with said first named tool in the compression of said sealing member.

10. The combination with a plug unit as described in claim 8 of a tubular tool releasably engageable in said riser with said formation of said actuating member for

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the threading adjustment of the latter, and a further tool insertable through said first named tool and releasably engageable with said cross-wise element of said tubular member for said supporting of the unit for said vertical adjustment in the riser, and for coaction with said first named tool in the compression of said sealing member, said further tool having means at the bottom thereof for a releasable bayonet and slot-type engagement with said element.

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