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APPARATUS FOR CONTROLLING FLUID FLOW THROUGH CONDUIT MEANS

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2 Sheets-Sheet 1

FIG. 1

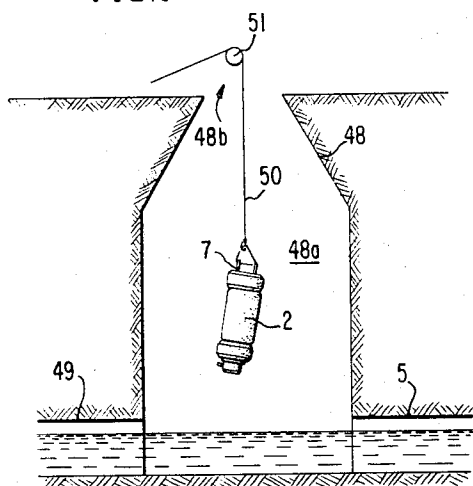


FIG. 2

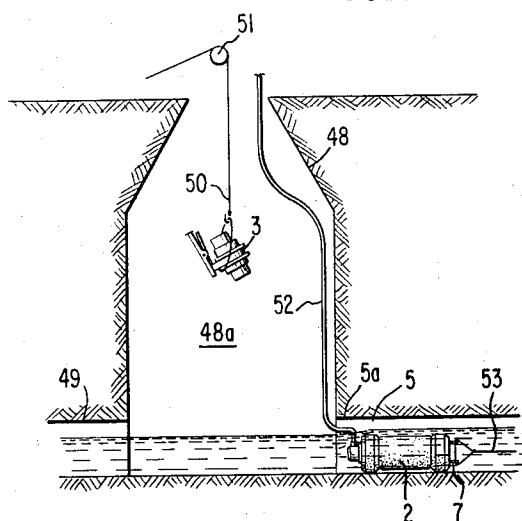


FIG. 3

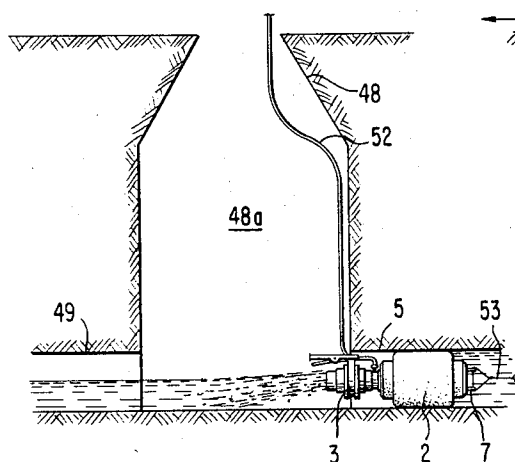
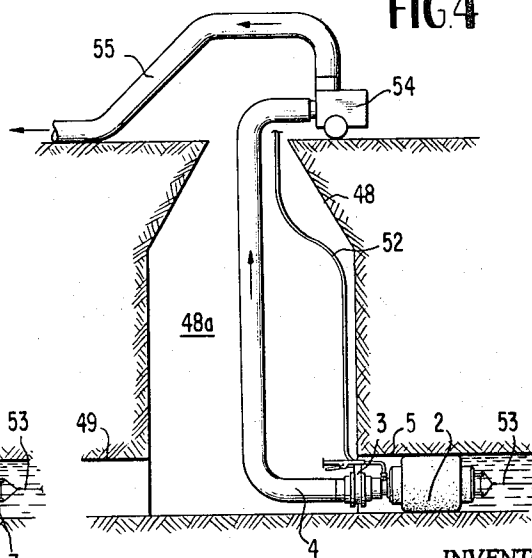


FIG. 4



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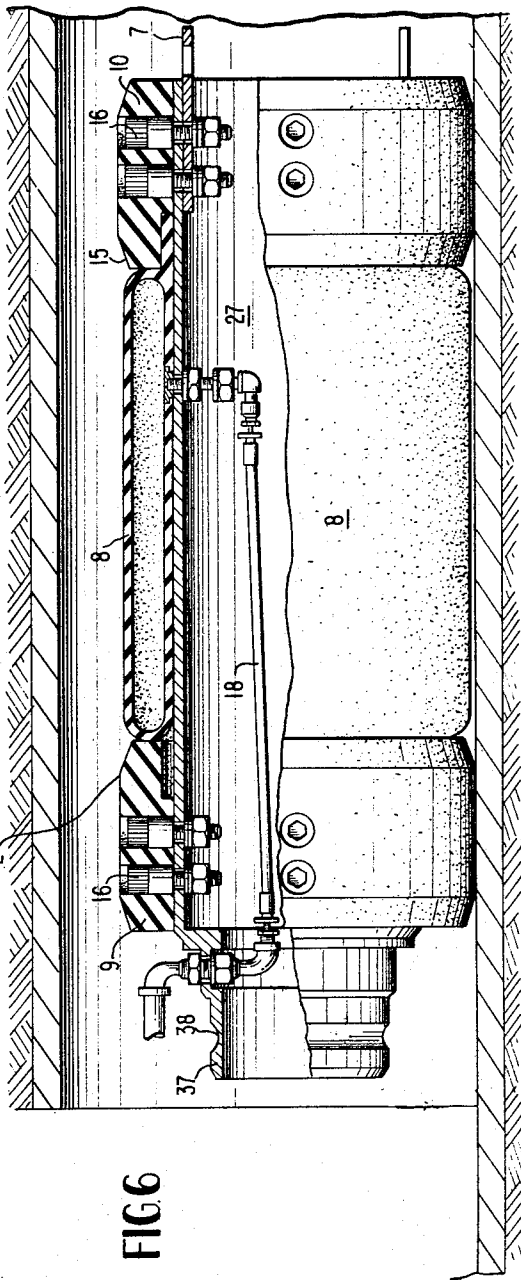
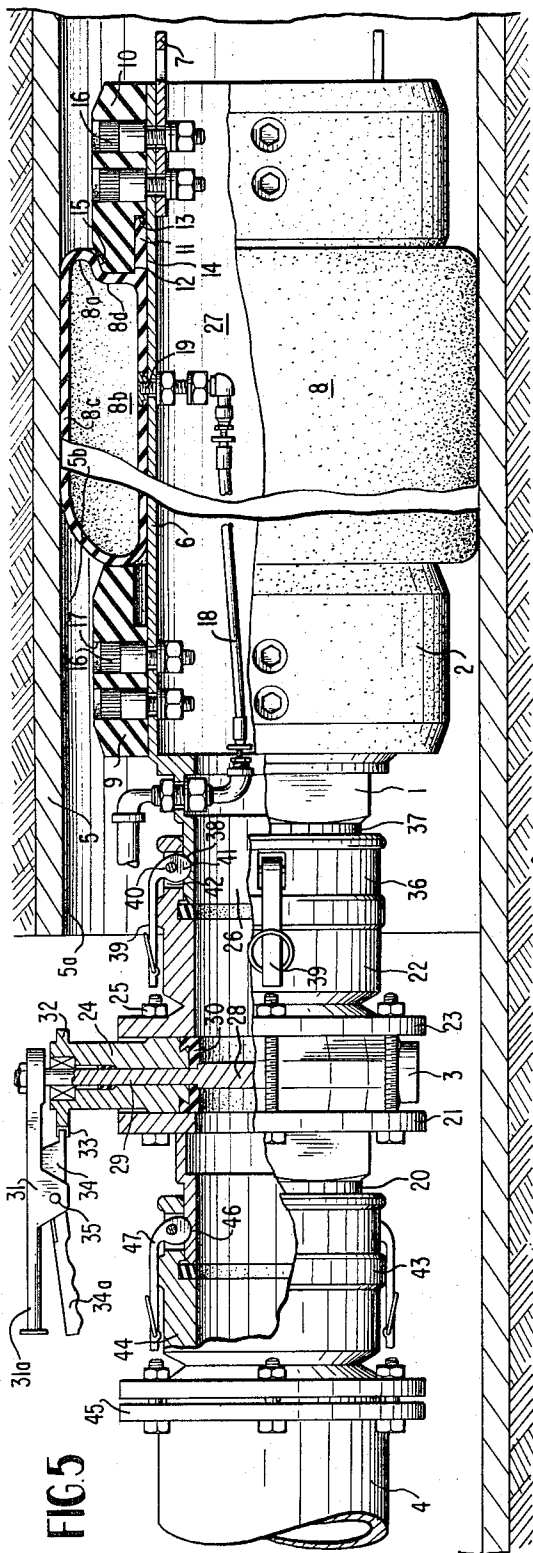


FIG 6

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3,401,720 APPARATUS FOR CONTROLLING FLUID FLOW THROUGH CONDUIT MEANS

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ABSTRACT OF THE DISCLOSURE

Apparatus for controlling flow through conduits such as sewer lines. The apparatus includes an arrangement for wedging a portion of an inflatable packer between a sewer line and a wedging element carried by the apparatus itself. The inflatable packer carries an annular web which lies directly against a cylindrical body portion of the apparatus and is received within an annular groove defined by an apparatus guide shoe.

The apparatus includes selectively connectable and disconnectable valve and packer assemblies.

GENERAL BACKGROUND OF INVENTION

This invention relates to apparatus for controlling fluid flow through conduit means. In particular, it relates to apparatus used in conjunction with the controlling of fluid flow through sewer lines.

Periodically, sewer lines develop leaks at joints or incur damage so as to require maintenance and repair. In effecting such maintenance and repair, it is desirable to block, divert, or regulate the flow of fluid through a sewer line upstream of the site where maintenance or repair operations are to be performed. Such controlling of sewer flow is often effected by means of a sewer plug which is temporarily secured within a sewer line upstream of a repair or maintenance site.

While a variety of sewer plugs have been previously developed, in most instances they have been characterized by structural or operational defects.

Many previously developed sewer plugs include arrangements for securing them within sewer lines, which arrangements are either complex and difficult to operate or not altogether reliable in operation. Many such holding arrangements are difficult or inconvenient to release when it is desired to remove a plug from a sewer conduit.

Many sewer plugs are so large and cumbersome as to make their installation and removal difficult. The size and weight of many such plugs makes it extremely difficult to manipulate these plugs within manholes while attempting to install them in sewer lines which discharge into the manholes.

Many such previously developed sewer plugs do not include flow regulating means which provide optimum control and regulation over sewer flow and which enable sewer flow to be controlled for the purpose of flushing out debris downstream of a plug.

OBJECTS AND SUMMARY OF INVENTION

Recognizing the need for improved methods and apparatus for controlling fluid flow through sewer conduits, it is a principal object of the present invention to provide apparatus, relating to the use and operation of sewer plugs, which minimize or obviate defects of previously known sewer plugs as above indicated.

It is a further object of the invention to provide such improved apparatus by means of which a sewer plug may be installed with limited personnel and in a confined space with improved ease.

It is likewise an object of the invention to provide such improved apparatus by means of which a sewer plug may

be more positively secured within a sewer line and more easily released from the sewer line when it is desired to remove the plug.

A still further object of the invention is to provide such apparatus by means of which a sewer plug becomes more positively secured within a sewer line in response to the pressure of fluid flowing through the line and acting against the plug.

Yet another object of the invention is to provide such apparatus by means of which a sewer plug may be installed in modular units.

It is also an object of the invention to provide such apparatus by means of which flow through a sewer line may be constrained to issue from the downstream side of the sewer plug as a jet-like stream capable of flushing away debris.

A still further object of the invention is to provide such apparatus by means of which sewer plug components may be easily and quickly connected within a manhole and easily and quickly disconnected at this site.

One aspect of this invention, intended to accomplish some of the foregoing objects, entails apparatus for controlling fluid flow through conduit means. Involved in the operation of this apparatus is the disposition of flow controlling plug means within the interior of conduit means such as a sewer. An annular portion of the plug means is wedged against an annular interior portion of the conduit means. Simultaneous with this wedging, force is directed radially outwardly from the plug means and exerted against the conduit means so as to prevent axial movement of the plug means within the conduit means. The wedging and radially directed force is maintained by fluid pressure such that a reduction in this pressure will free the plug means for axial movement through the conduit means.

Other aspects of the invention involve the manner in which fluid flowing through the conduit means is constrained while passing through the plug means so as to increase the flow velocity of the fluid and confine the fluid to a jet-like stream issuing from the downstream side of the plug means.

Another independently significant aspect of the invention involves the sequential installation of modular portions of the plug means.

In combination, the foregoing facets of the invention provided a particularly significant and advantageous concept.

Apparatus presented through the invention for accomplishing some of the foregoing objects comprises generally tubular body means and valve means. This valve means includes restricted passage means and a valve plate mounted for rotation about an axis extending transversely across the passage means. Generally tubular, annular and fluid inflatable packer means encircles at least a portion of the body means. Generally annular guide shoe means, secured to the outer periphery of said body means is positioned adjacent said packer means. Generally annular web means connected, with the packer means, lies adjacent the outer periphery of said body means and extends generally axially toward said guide shoe means. Portions of the annular guide shoe means define a generally annular recess adjacent the outer periphery of the body means and facing the packer means. The aforesaid web means projects into this annular recess.

An additional and individually noteworthy apparatus aspect of the invention which is significant and particularly advantageous in the context of the previously described apparatus combination involves wedge means defined by a portion of the guide shoe means. This wedge means cooperates with the packer means to wedge the apparatus against conduit means in which it is inserted.

Another significant facet of the invention pertains to detachable connecting means structure which may serve to secure the valve means to the body means of the apparatus.

Drawings

In describing the invention reference will be made to a preferred embodiment illustrated in the application drawings.

In the drawings:

FIGURE 1 schematically illustrates a body portion of a sewer plug of the present invention being lowered into a manhole;

FIGURE 2 schematically illustrates a valve portion of a sewer plug of the present invention being lowered into a manhole after the body portion has been inserted into a sewer conduit which discharges into a manhole;

FIGURE 3 schematically illustrates the valve portion and body portion of the sewer plug of the present invention interconnected and installed to control flow through the aforesaid sewer;

FIGURE 4 schematically illustrates the assembled sewer plug of FIGURE 3 coupled with a flow line and pump mechanism for diverting flow upwardly out of, and away from, the manhole;

FIGURE 5 is a fragmentary, schematic, and partially sectioned elevational view of the installation shown in FIGURE 4 in the vicinity of the sewer plug; and

FIGURE 6 is a fragmentary, schematic, and partially sectioned elevational view of the sewer plug body portion shown in FIGURE 2 illustrating a disposition of apparatus elements prior to the securing of the plug to the sewer line interior.

Apparatus

An assembled, installed, and operative sewer plug assembly 1 is shown in FIGURE 5.

Plug assembly 1 comprises a body portion 2 and a valve portion 3. As shown in FIGURE 5, the assembled sewer plug 1 may be detachably connected with a conduit 4 for leading fluid through a confined path away from the assembly. Such fluid would flow to the plug 1 through a sewer line 5 in which the plug is installed.

The plug body portion 2 includes tubular body means 6 having a generally cylindrical configuration. Apertured lugs 7 may be attached to the body 6 by conventional fastening means so as to provide a mechanism for attaching the plug to hoisting or handling lines.

A generally tubular, annular and fluid inflatable packer 8 is mounted on and encircles a central portion of the body 6. Packer 8 is fabricated of elastomeric material such as rubber. Annular guide shoes 9 and 10 are mounted on opposite ends of the body 6. Guide shoes 9 and 10 may be fabricated of relatively hard, elastomeric material and have tapered ends which serve to facilitate the insertion of the body 2 into the open end 5a of the sewer line and may serve to facilitate the sliding of the body 2 into this line. As illustrated, guide shoes 9 and 10 are disposed adjacent opposite ends of the packer 8.

A generally annular web 11 is connected with the packer 8 and extends from the packer 8 generally axially toward the guide shoe 10. As illustrated, web 11 is preferably disposed immediately adjacent the outer periphery of the cylindrical body 6.

Axial and radially extending walls 12 and 13, respectively, which are formed in guide shoe 10, define a generally annular recess 14 encircling and lying immediately adjacent the cylindrical body 6. This recess 14 faces the packer 8 and slidably receives the annular web 11.

A generally frustoconical wedging surface 15 is formed on the outer periphery of the guide shoe 10 adjacent the packer 8. Wedging surface 15 slopes generally radially outwardly in a direction extending axially away from the packer 8.

As illustrated in FIGURE 5 and as will be hereinafter described in greater detail, wedging surface 15 is adapted

to wedgingly engage an end portion 8a of the inflated packer 8. This wedging results from the exertion of force on the body 6 while the packer 8 is frictionally secured against the conduit inner periphery 5b. This securing action is a consequence of pressurized air within the packer interior 8b exerting a radially outwardly directed force on the outer packer wall 8c. This radially directed force is transmitted through the packer 8c to the conduit periphery 5b so as to frictionally secure the packer 8 against the conduit 5. With the packer 8 thus secured and an axial force exerted on the body 6, the wedging surface 15 will tend to wedgingly move against the packer end 8d so as to wedge the radially outermost and annular packer end portion 8a between the wedging surface 15 and the conduit periphery 5b. As will be appreciated, the greater the axial force exerted against the cylindrical body 6, the greater the securing effect the wedging action will have.

As the packer 8 expands in response to the introduction of pressurized fluid, some axial shortening of the packer may occur. Should this shortening take place, the web 11 will merely move axially, partially out of the annular recess 14. However, the web 11 will remain sufficiently contained within the recess 14 so as to secure the upstream end 8d of the packer 8 against the cylindrical body 6. This securing action, afforded by the cooperation of the web 11 and the recess 14, will tend to prevent an excessive portion of the packer 8 from moving into wedging position between the guide shoe 10 and the conduit periphery 5b.

Guide shoes 9 and 10 may be secured on body 6 by conventional, radially extending, threaded fasteners 16 which are secured to the body 6 and extend into radial apertures 17 formed in the shoes 9 and 10. As shown in FIGURE 5, these fasteners may also serve to secure the lugs 7.

Conduit means 18, including conventional conduit sections and conduit couplings, may be mounted upon the cylindrical body 6 so as to supply pressurized air, gas or other fluid to the interior 8b of the packer 8. As schematically shown in FIGURE 5, a conventional coupling 19 may comprise the sole rigid connection between the packer 8 and the cylindrical body 6 and as the means for passing fluid into the interior 8b of the packer 8.

Valve portion 3 of the apparatus includes a generally tubular, axial extension 20 having a radially and outwardly extending flange 21 and another tubular and axial extension 22 having a radially and outwardly extending flange 23. A generally annular valve body 24 is interposed between flanges 21 and 23. Conventional threaded fasteners 25 passing through the flanges 21 and 23 may serve to secure the tubular portions 20 and 22 and the valve body 24 in unitary relationship. With these elements assembled as shown in FIGURE 5, a passage 26 is defined which extends generally coaxially of the central passage 27. Central passage 27, as shown in FIGURE 5 extends entirely through the cylindrical body 6. As illustrated, passage 26 is restricted, i.e. of relatively small size, in relation to the passage 27.

A valving plate 28 is supported within the valve body 24 and mounted for rotation upon a spindle 29 which is journaled within the valve body 24. As schematically shown, valving plate 28 is mounted for rotation about the axis of the spindle 29, which axis extends transversely of and through the central axis of the passage 26. Valve plate 28 may be disposed within a conventional annular valve seal or gasket 30.

A manually operable handle 31 may be affixed to the valve spindle 29. A flange 32 carried by the valve 24 body projects radially of the axis of rotation of the spindle 29 and may be provided with a plurality of recesses or notches 33 which open radially outwardly of the axis of the spindle 29. A detent 34 supported on the handle 31 by a conventional pivot mount 35 is adapted to releasably engage the notches 33 so as to secure the valve

plate 29 and the handle 31 in selected positions. In this fashion, the position of the plate 28 may be positively secured so that the plate may be locked, for example, in a position extending transversely of the passage 26 so as to close this passage or in a position extending axially of the passage so as to allow flow therethrough. A conventional, spring-biasing arrangement, not shown, may be incorporated in the handle 31 so as to hold the detent 34 in a position of engagement with notch 33. With this spring-biasing arrangement, by grasping a handle portion 31a and a detent handle 34a, and squeezing these elements together, the detent 34 may be moved out of locking engagement with a notch 33 of the flange 32.

Detachable coupling means 36, comprising opposing ends of the body portion 2 and the valve portion 3, may serve to detachably interconnect these sewer plug portions

This detachable connecting means comprises the tubular extension 22 of the valve portion 3 and a tubular extension 37 projecting coaxially of and connected with the cylindrical body 6. In the assembled sewer plug 1, the tubular extension 37 is telescopically received within the tubular extension 22 as shown in FIGURE 5.

An annular groove 38 is formed on the outer periphery of the innermost tubular extension 37. A plurality of locking lugs 39 are carried by and circumferentially spaced around, the tubular extension 22. Each locking lug is supported on a pivot shaft 40 and includes a cam-type detent or lug 41 which projects radially through aperture 42 formed in the extension 22. When the handle 39 is pivoted to lie adjacent the outer periphery of the extension 22, the cam-type lug 41 is lockingly engaged with the recess 38. When the handle 39 is pivoted outwardly about the shaft 40, and away from the outer periphery of the extension 22, the lug 41 is pivoted out of the recess 38, i.e. out of interlocking engagement with this recess or groove.

It will be appreciated that the detachable connecting means 36, in addition to affording an easily manipulated detachable connection, defines a portion of the restricted passage 26 leading away from the plug body portion 2.

Detachable connecting means 43, substantially identical to connecting means 36, may be employed to secure the valve portion 3 to a conduit 4.

This detachable connecting means 43 may comprise the tubular extension 20 of the valve portion 3, a tubular extension 44 connected to the conduit 4 by flange means 45, an annular groove 46 formed on the outer periphery of the extension 20, and a plurality of pivoted locking lugs 47 carried by the tubular extension 44.

Method of installation and operation

With the structure of the sewer plug components having been described, the manner in which the plug 1 is installed and utilized may now be considered.

In describing the installation and use of the plug 1, reference will be made to FIGURES 1 through 4 which schematically illustrate a representative sewer manhole installation.

As shown in FIGURES 1 through 4, a manhole 48 is intersected by a sewer line 5 which discharges into the interior manhole space 48a. Another sewer line 49 carries fluid away from the manhole 48.

The plug body portion 2 may be lowered into manhole 48 by conventional hoisting cable means 50 secured to the lugs 7. The hoisting cable 50 may extend upwardly to a sheave 51 which comprises a portion of conventional hoisting equipment disposed above the manhole opening 48b.

One or more workmen within the manhole 48 manipulate the plug body portion 2 into the end 5a of the inflow sewer conduit 5. While this installation is taking place, the packer 8 remains in its uninflated condition as shown in FIGURE 6.

With the plug body portion 2 installed as shown in FIGURES 2 and 6, pressurized air may be supplied to

the packer inflating, conduit means 18 by a flexible conduit 52. Conduit 52 extends upwardly from the plug body 2 and out of the manhole 48 to a source of pressurized fluid, not shown. This supplied air will expand the packer 8 radially outwardly into engagement with the conduit wall 5b.

With the plug body 2 secured in place, the plug valve portion 3 may be lowered by the hoisting means 50 into the manhole 48. One or more workmen within the manhole 48 manipulate the valve portion 3 so as to secure the tubular portions 22 and 37 of the detachable coupling 36 in telescoped and interlocking relationship. As previously noted, the interlocking of the plug body portion 2 and valve portion 3 is effected by manipulating the handles 39 so as to move the locking lugs 41 into interlocked engagement with the annular groove 38.

With the plug assembled and installed as shown in FIGURES 3 and 5, and the plug secured to the conduit 6 by the expansion of the packer 8, fluid flow from the sewer line 5 may be interrupted or regulated as desired by appropriate manipulation of the valve handle 31a.

With the valve plate 28 moved to a position to block flow through the plug 1, fluid may accumulate upstream of the plug 1. When sufficient fluid has accumulated, the valve plug 28 may be moved to an open valve position so as to allow fluid built up upstream of the plug 1 to discharge through the restricted passage 26. The restricted nature of the passage 26 may cause a discharge of fluid from the plug 1 in a generally jet-like stream. This jet may be selectively utilized to facilitate the flushing away of debris from the interior of the base of the manhole 48.

Under certain circumstances, it may be desirable to attach cable means 53 to the plug lugs 7, which cable means 53 extends from an upstream manhole, not shown. Cable means 53, thus disposed, may serve to provide additional securing means for the plug 1 within the conduit 5.

Under certain circumstances, it may be desirable to allow flow from the sewer conduit 5 to pass through the plug 1 and be diverted upwardly and out of the manhole 48. Where such flow diversion is desired, the previously noted flow diverting conduit 4 is secured by the detachable connecting means 43 to the valve portion 3 of the sewer plug 1. As schematically shown in FIGURE 4, diversion conduit 4 may extend upwardly to a portable pump unit 54. A flow line 55 may extend from the pump 54 to a manhole downstream of a repair site in the conduit 49 so as to effectively bypass sewer flow around this repair site.

With the valve plate 28 of the sewer plug 1 disposed in a closed valve position, or with the diversion line 4 being utilized, fluid pressure will be exerted against the plug 1 by fluid upstream of the plug 1. This fluid pressure applied to the plug 1 will cause an axial force to be imposed upon the cylindrical body 6 so as to tend to move the body 6 toward the manhole 48. As previously noted, this applied axial force will tend to cause the wedging surface 15 to wedgedly engage the packer end portion 8a so as to more positively secure the plug against axial movement within the conduit 5. As will be apparent, the greater the fluid pressure applied against the upstream end of the plug 1, the greater will be the holding force on the plug 1 resulting from this wedging action.

When it is desired to release the plug 1, it is merely necessary to detach the line 4 and valve portion 3 and then exhaust fluid from the packer interior 8b through the conduit means 18. This exhaust of fluid will allow the packer 8 to collapse so as to immediately interrupt the previously noted frictional and wedging securing actions and free the plug body portion 2.

Advantages and scope of the invention

A particular advantage attributable to the invention involves the modular character of the sewer plug and

the convenient and rapid manner in which the plug components may be interconnected or supported in the confined working space of a manhole.

As will be appreciated, sewer lines are of substantial size such that sewer plugs used to control flow there- 5 through are both large in size and heavy. For example, many sewer plugs have a diameter of several feet and weigh several hundred pounds. With the sectional or modular character of the sewer plug of present invention, relatively small components of the plug may be individ- 10 ually lowered into a manhole and installed in a sewer line.

This, of course, minimizes the working space required for the installation of a plug and minimizes the number of personnel required for its installation.

With the type of detachable connections utilized in the preferred sewer plug embodiment, a variety of combina- 15 tions of plug components is made possible. For example, under certain circumstances it may be desirable to connect the diversion line 4 direction to the plug body portion 2. The interchangeable character of the detachable connections 36 and 43 readily permits this mode of utili- 20 zation of the invention.

Another significant facet of the invention involves the manner in which the valve unit and its associated detach- 25 able coupling means provides a restricted and valved pas- sageway by means of which sewer flow may be confined to a debris clearing jet.

Another and particularly significant advantage of the invention involves the manner in which a guide shoe and inflatable packer cooperate to provide a wedging action 30 which tends to secure the sewer plug with increasing effectiveness as fluid pressure builds up upstream of the plug.

Another especially advantageous feature of the inven- 35 tion involves the manner in which the detachable couplings 36 and 43 may be manipulated independently of the relative rotational positions of the body portion 2, valve portion 3 and diversion conduit 4. In other words, the annular latching grooves 38 and 46 enable the couplings 36 and 43 to be utilized regardless of the relative 40 rotary positions of the plug components.

While the invention has been described with reference to preferred embodiments, those familiar with this disclosure and skilled in the sewer repair art may well envi- 45 sion additions, deletions, substitutions, or other modifica- tions which would fall within the purview of the invention as defined in the appended claims.

I claim:

1. An apparatus controlling flow through conduit means 50 such as sewer lines, said apparatus comprising:
 - generally tubular body means having a central passage and an open end providing fluid communication between said central passage and the exterior of said body means;
 - valve means;
 - said valve means including:
 - restricted passage means communicating with said central passage, and
 - a valve plate mounted for rotation about an axis extending transversely across said passage 60 means;
 - generally tubular, annular and fluid-inflatable packer means peripherally encircling at least a portion of said body means and having:
 - a cylindrical, elastomeric wall portion lying im- 65 mediately adjacent said body means, and
 - a radially outwardly, movable, elastomeric wall portion encircling said cylindrical wall portion, said movable wall being connected with said cylind- 70 rical wall portion to define a closed, generally annular, fluid chamber;
 - generally annular unitary guide shoe means secured to the outer periphery of said body means adjacent said packer means;
 - generally annular web means connected with said 75

- packer means, lying immediately adjacent the outer periphery of said body means, and extending generally axially toward said guide shoe means and defining a continuation of said cylindrical wall portion of said packer means;
- portions of said guide shoe means defining a generally annular recess immediately adjacent the outer periph- 5 ery of said body means and facing said packer means, with said web means projecting thereinto;
- wedge means carried by said guide shoe means axially adjacent said packer means;
- said valve plate including fluid reaction surface means operable to exert axial force on said tubular body means in response to the pressure of fluid within said conduit means and said central passage;
- said tubular body means being axially movable relative to the outer periphery of said packer means, when said packer means is inflated and expanded radially into peripheral engagement with said conduit means to cause said guide shoe means to wedgingly engage said outwardly movable wall means of said inflated packer means.
- 2. An apparatus controlling flow through conduit means, said apparatus comprising:
 - generally tubular body means;
 - valve means;
 - said valve means including:
 - restricted passage means, and a valve plate mount- 10 ed for rotation about an axis extending trans- versely across said passage means;
 - generally tubular, annular and fluid-inflatable packer means peripherally encircling at least a portion of said body means;
 - generally annular guide shoe means secured to the outer periphery of said body means adjacent said packer means;
 - generally annular web means connected with said packer means, lying adjacent the outer periphery of said body means, and extending generally axially toward said guide shoe means;
 - portions of said guide shoe means defining a generally annular recess adjacent the outer periphery of said body means and facing said packer means, with said web means projecting thereinto;
 - detachable connecting means for securing said valve means to said body means, said detachable connect- 15 ing means comprising:
 - a first tubular portion carried by and projecting axially of said body means,
 - a second tubular portion carried by and projecting axially of said valve means,
 - said first and second tubular portions being dis- posed in mutually telescoped relation,
 - annular groove means on the outer periphery of the innermost of said telescopingly assembled tubular members,
 - locking means pivotably mounted on the outer- 20 most of said telescoping tubular members, said locking means being pivotable from a position of interlocking engagement with said annular groove means to a position out of interlocking engagement with said annular groove means;
 - a manually operable handle connected with said valve plate; and
 - detent means for securing said handle and said valve plate in predetermined positions.
 - 3. An apparatus as described in claim 2 including:
 - wedge means defined by a portion of said guide shoe means adjacent said packer means;
 - said wedge means comprising an annular wedging sur- 25 face which slopes generally radially outwardly in a direction extending axially away from said packer means;
 - said wedging surface being adapted to wedgingly en- gage a portion of said packer means, in its inflated

condition, in response to an axial force exerted on said body means tending to move said wedging surface toward said inflated packer means.

4. An apparatus controlling flow through conduit means, said apparatus comprising:
 generally tubular body means;
 valve means;
 said valve means including:
 restricted passage means, and
 a valve plate mounted for rotation about an axis extending transversely across said passage means;
 generally tubular, annular and fluid-inflatable packer means peripherally encircling at least a portion of said body means;
 generally annular unitary guide shoe means secured to the outer periphery of said body means adjacent said packer means;
 generally annular web means connected with said packer means, lying immediately adjacent the outer periphery of said body means, and extending generally axially toward said guide shoe means;
 portions of said guide shoe means defining a generally annular recess immediately adjacent the outer periphery of said body means and facing said packer means, with said web means projecting thereinto;
 wedge means defined by a portion of said guide shoe means adjacent said packer means;
 said wedge means comprising an annular wedging surface which slopes generally radially outwardly in a direction extending axially away from said packer means;
 said wedging surface being adapted to wedgingly engage a portion of said packer means, in its inflated condition, in response to an axial force exerted on said body means tending to move said wedging surface toward said inflated packer means; and
 said portion of said packer means, when so wedgingly engaged, being wedged between said wedging surfaces and an interior portion of conduit means in which said apparatus is disposed.
5. Apparatus for controlling fluid flow through conduit means such as sewer lines, said apparatus comprising:
 means for disposing flow controlling plug means within the interior of conduit means with said plug means having a cylindrical outer periphery and being axially movable within said conduit means in response to fluid pressure exerted axially thereon;
 fluid reaction surface means carried by said plug means and operable to move said plug means axially in response to the pressure of fluid within said conduit means;
 tubular, and generally annular, fluid inflatable, packer means carried by said plug means and having:
 cylindrical and elastomeric inner wall means conformingly engaging the outer periphery of said plug means, and

- elastomeric outer wall means encircling said inner wall means and movable radially away from said inner wall means in response to fluid pressure acting between said inner and outer wall means, said outer wall means being connected with said inner wall means to define a closed, generally annular fluid chamber;
 wedge means carried by said plug means and operable in response to axial movement of said plug means to wedgingly engage said outer wall means with said outer wall means being urged radially outwardly by fluid pressure against an annular interior portion of said conduit means;
 said packer means being operable to exert radially directed force outwardly from said plug means and against said conduit means so as to prevent axial movement of said plug means within said conduit means; and
 means for maintaining said radially directed force by fluid pressure such that a reduction in said fluid pressure will free said plug means for axial movement through said conduit means.
6. Apparatus described in claim 5:
 wherein said plug means includes a restricted, generally tubular, passageway, said passageway increasing the flow velocity of fluid flowing through said conduit means and confining said fluid to a jet issuing from the downstream side of said plug means.
7. Apparatus as described in claim 5 including:
 means for first disposing an elongate body portion of said plug means first within said conduit means; and
 means for thereafter coupling a valved portion of said plug means to said elongate body portion.
8. Apparatus as described in claim 7:
 wherein said plug means includes a restricted, generally tubular, passageway, said passageway increasing the flow velocity of fluid flowing through said conduit means and confining said fluid to a jet issuing from the downstream side of said plug means.

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