Sept. 20, 1971 L. G. CHERNE 3,605,799

SEWER FLOODING CONTROL SYSTEM

Filed April 24, 1970 4 Sheets-Sheet 1

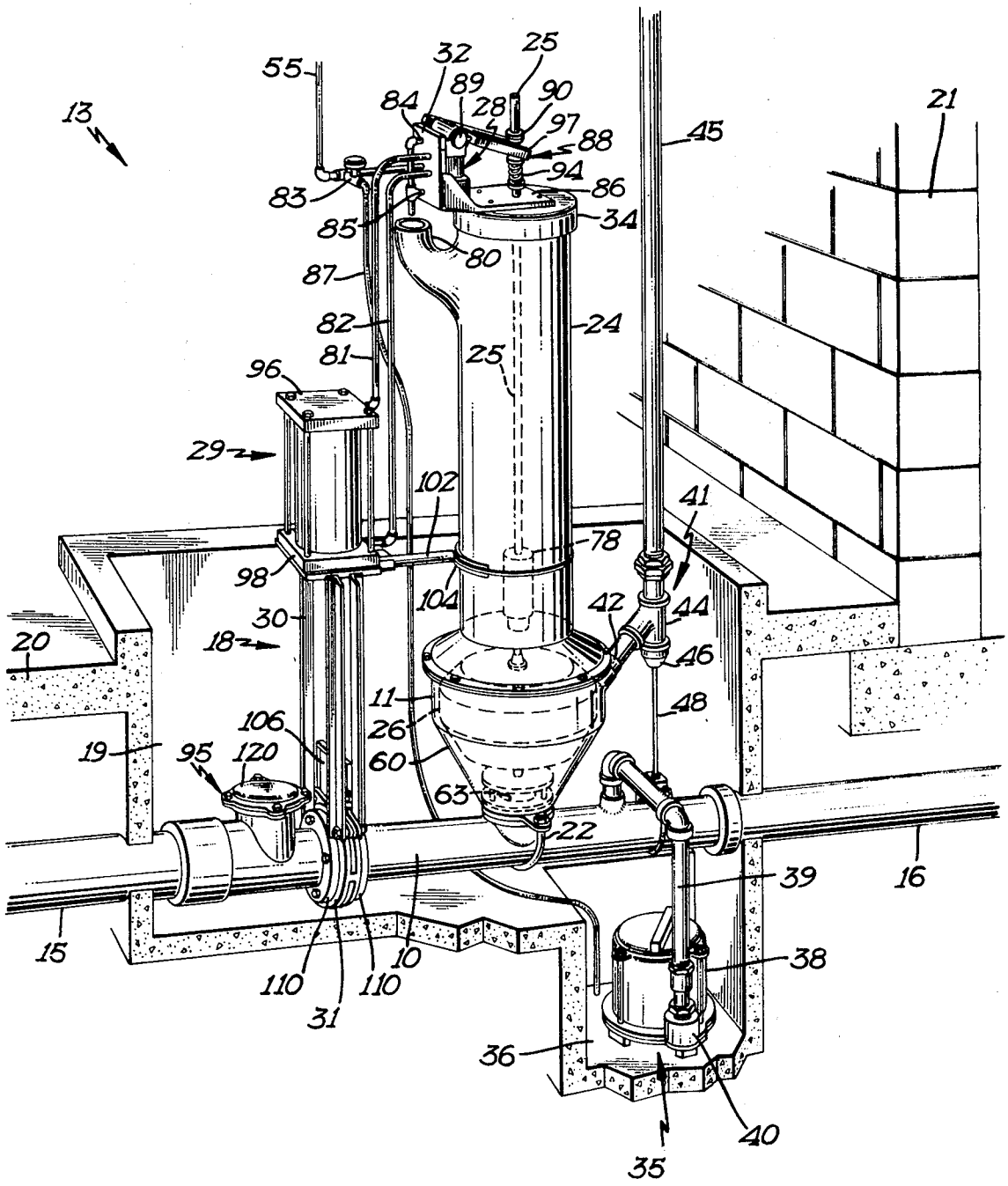


FIG 1

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SEWER FLOODING CONTROL SYSTEM

Filed April 24, 1970 4 Sheets-Sheet 2

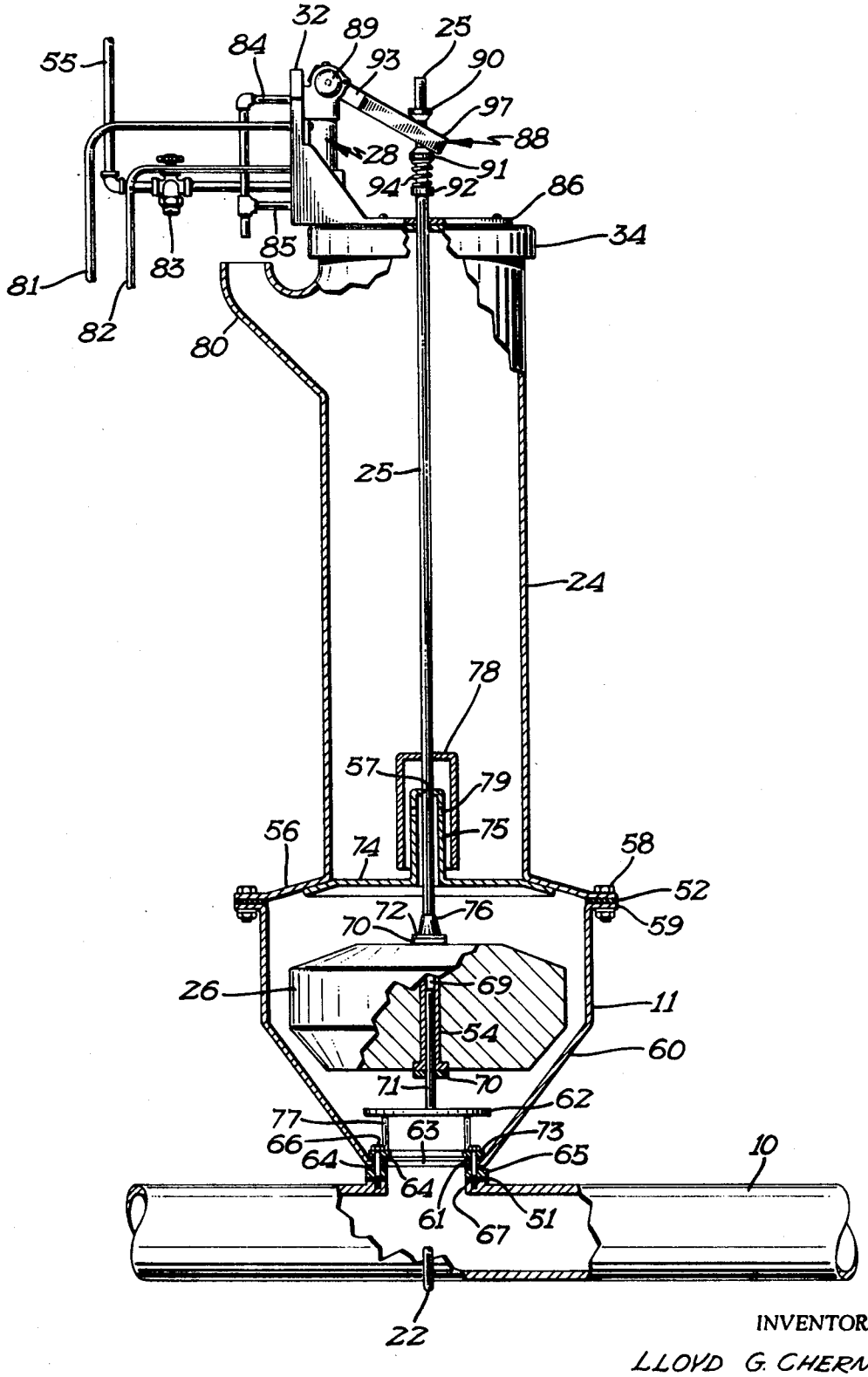


FIG 2

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SEWER FLOODING CONTROL SYSTEM

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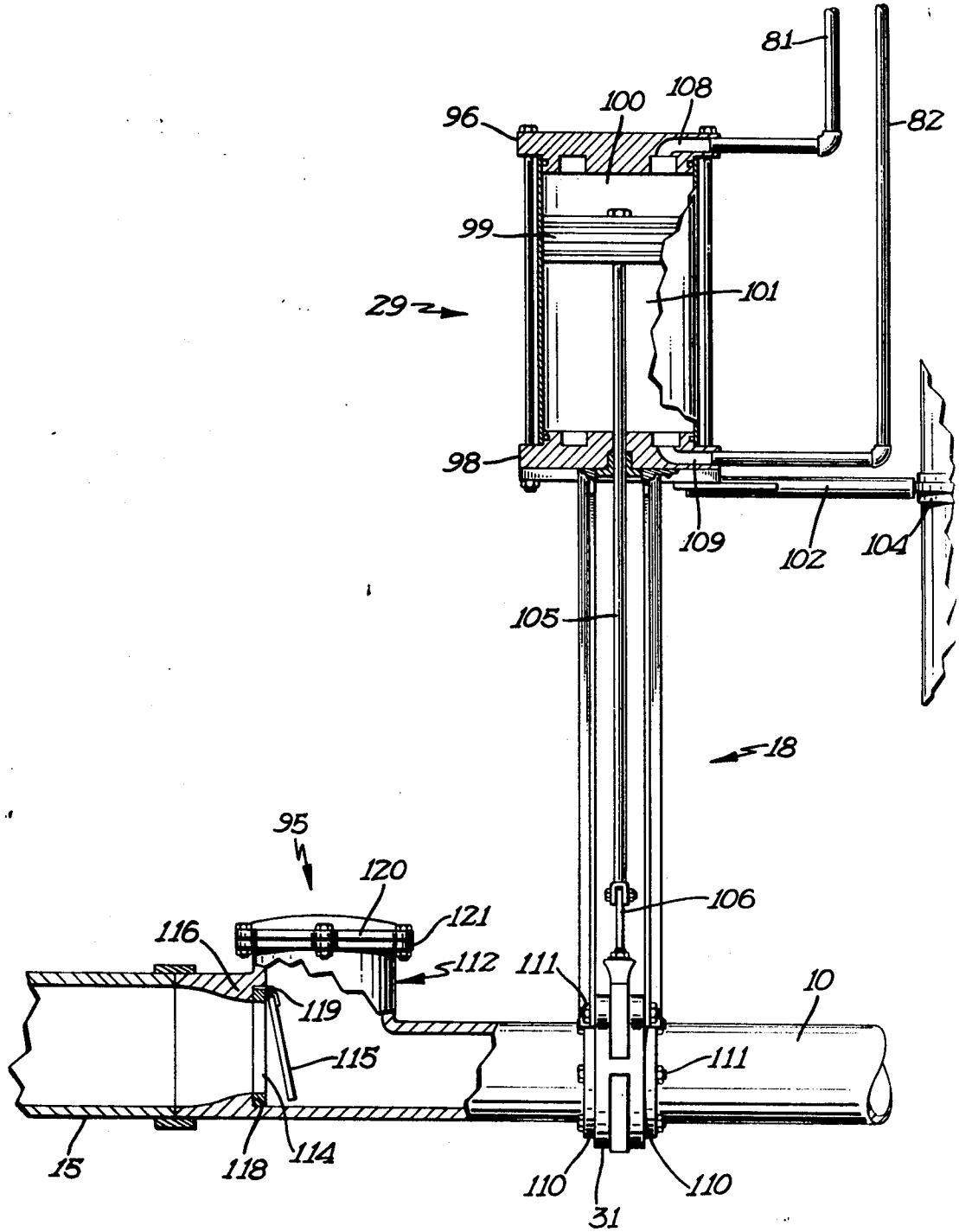


FIG 3

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SEWER FLOODING CONTROL SYSTEM

Filed April 24, 1970 4 Sheets-Sheet 4

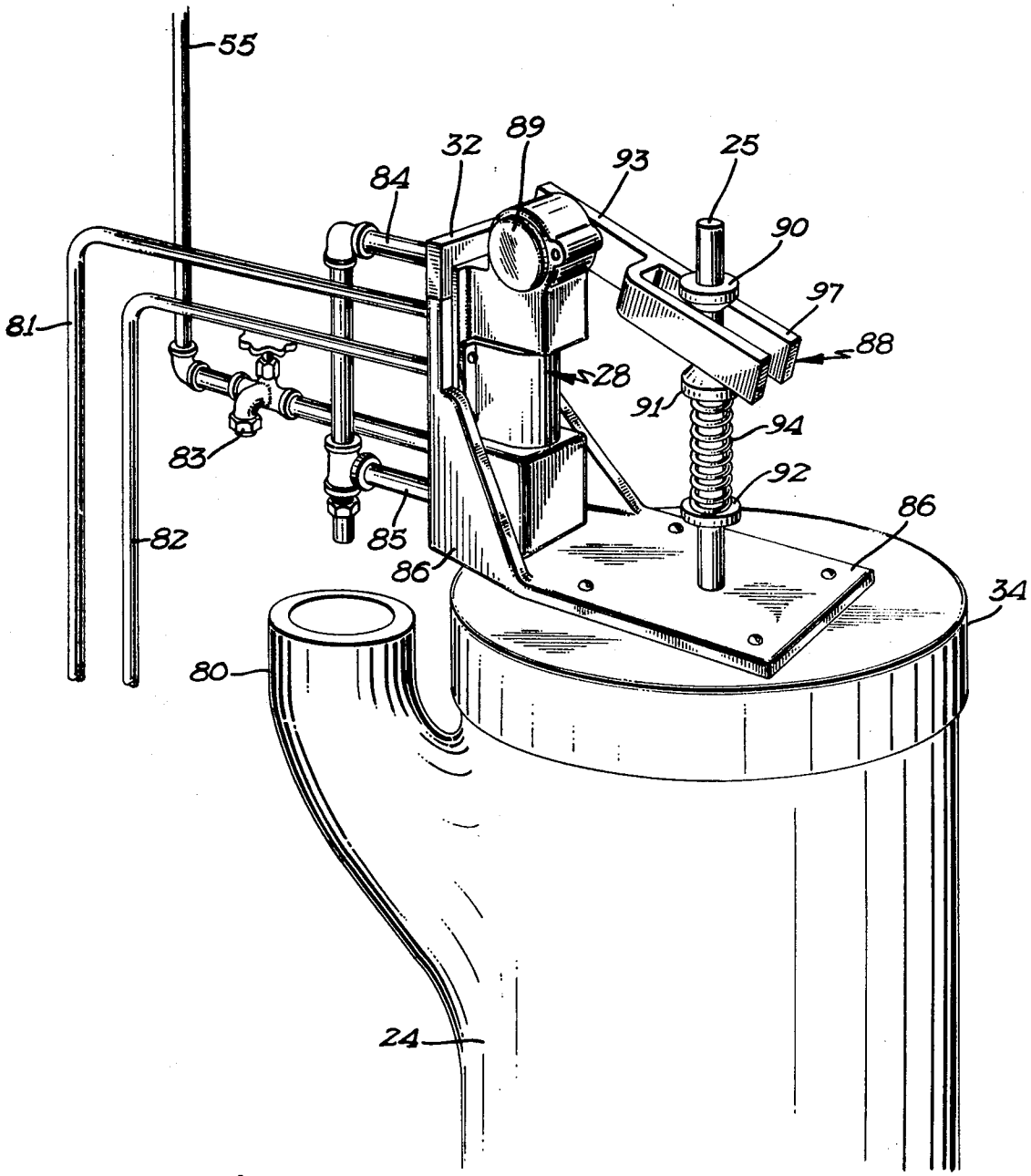


FIG 4

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3,605,799

SEWER FLOODING CONTROL SYSTEM

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Int. Cl. F16k 31/26
U.S. Cl. 137—413 10 Claims

ABSTRACT OF THE DISCLOSURE

An improved sewer flooding control system utilized to prevent the flooding of a building basement because of a backup in the building sewer or the surging of sewage in the sewer. The improved sewer flooding control system is mounted below the floor level of a basement to be protected and is actuated by the presence of sewer flooding conditions in the sewer. The improved system also provides novel means for preventing flooding or damage as a result of surging sewage both in the basement as well as within the system, and also provides novel guide means for guiding a float and preventing damage from surging. When flooding conditions exist, a float member rises with the level of the sewage, and in turn, causes a valve to close in the sewer pipe, thereby preventing any flow of sewage through the pipe. When flooding conditions subside, the float is correspondingly lowered with the level of sewage and the valve is opened.

BACKGROUND OF THE INVENTION

This invention relates to a sewer flooding control system and more particularly to a system which prevents basement flooding due to sewer backup, as a result of excessive precipitation or other similar causes, or as a result of the surging of the backup sewage.

During the normal operation of a building drainage system, the waste water or sewage flows by gravity from a floor drain, through a building sewer and into a street sewer to be carried away with other sewage. Under certain conditions, especially during heavy rainstorms, the level of sewage in the street sewer is quite high, and in some cases, is higher than the level of the floor drain. When this occurs, the drainage process is reversed and sewage flows from the sewer through the floor drain and into the basement to cause flooding. The general purpose of a sewer flooding control system is to prevent this type of backup flooding.

In the past, several types of sewer flooding control systems have been used to prevent the backup of sewage into basements or other areas where the area in question was connected to the sewage system by means of a conventional floor drain. Although these systems operated satisfactorily to prevent flooding, the protection against surging was incomplete and the systems themselves were often in need of repair or maintenance.

Prior sewage control systems generally comprised a base or sewage receiving drum mounted to and in communication with a section of the building sewer pipe, a float within the drum designed to rise and fall in response to the flooding conditions of the building sewer, and a valve in the building sewer line that closed and opened in response to the rise and fall of the float respectively. With these members, the backup of sewage as a result of sewer flooding was prevented.

The bases or sewage receiving drums of prior control systems often were constructed of cast metal to which various types of sewage easily adhered. Particularly, sewage

having a greasy consistency often accumulated on the bottom sides of the base as the backup sewage retreated. After several floodings, this accumulation began to interfere with the movement of the float contained in the drum. Eventually, the accumulation was sufficient to render the float immovable, thereby causing the sewer valve to remain in a closed position. This position, although still preventing sewer flooding, also prevented the prior systems from operating properly when flooding conditions had subsided.

The floats in the prior systems were usually partially made of brass. These brass floats had a tendency to shatter easily, especially during surging when the float was forced up by a surge of the sewage, and then allowed to drop to the bottom side of the base as the sewage retreated. The shattered or cracked floats increased the maintenance costs of the system, and caused it to malfunction.

Furthermore, the protection against sewer flooding in prior systems was incomplete in that it did not provide for protection against surging. The sewer valve normally takes a substantial time (usually from 15–30 seconds) to close once the backup sewage, and thus the float, has reached a sufficiently high level. As a result, the prior systems offered no protection for the surge that came in quickly, and then rapidly retreated. This surging caused sewage to flow through the drain pipes and splash up through the floor drain into the basement.

SUMMARY OF THE INVENTION

In contrast to prior sewer flooding control systems, the improved system of the present invention requires only infrequent cleaning and very little maintenance and repair. In the present system, the base or the sewage receiving drum is made of polyethylene thereby providing a surface to which the sewage cannot adhere. In addition, the bottom side of the base slopes at an angle of about forty-five degrees with the horizontal, since it has been found that if the bottom side has this angle, the sewage and grease are prevented from accumulating on the bottom side of the base as in the prior systems.

The float contained in the base portion of the system is also made of polyethylene and filled with solid polyfoam. This structure provides for a longer lasting float that will not be subject to corrosion or oxidation, and will not shatter as a result of continuous or extended surging. In addition, means are provided for guiding the float in its up and down movement within the base to prevent a surging force from causing the float to come in contact with the side walls of the base.

Also, the present invention provides for a flap valve to be placed in the basement sewer line so that the surging of the sewer will not cause sewage to be forced through the drain into the basement. By installing this flap valve, the normal flow of sewage from the floor drain to the street sewer is not deterred. However, a sudden surge of sewage from the street sewer toward the floor drain will be substantially prevented by the valve so that no sewage will enter the basement through the floor drain while the basement sewer valve is closing. The flap valve is also designed to dissipate the energy of a surge of sewage and to prevent sewage from splashing into a basement as a result of that surge.

For a similar reason, an anti-splash plate is mounted between the bottom opening of the system base, which opens into the basement sewer, and the float within the base. This anti-splash plate prevents the surging sewage from splashing against the float, and dissipates the surging force so that the movement of the float is gradual.

Particularly, the sewer flooding control system of the present invention includes a base or sewage receiving drum along with a float whose movement responds to the level of the sewage in the drum. The base is in direct communication with the basement sewer line, thus the movement of the float is directly associated with the level of the sewage in the basement sewer. A valve opening and closing means is associated with the float so that movement of the float causes the valve to be opened or closed, thereby allowing or preventing, respectively, the sewage from passing through the basement sewer line. When the sewage in the base is at a high level so that the float is at its uppermost position, the valve is closed, thereby preventing the backup sewage from passing through the basement sewer into the basement. When the sewage in the base is such that the float is not at its uppermost position, the valve is open, thereby permitting waste to flow from the floor drain through the basement sewer and into the street sewer. In addition, the control system includes a leak detector to detect leaks in the base and float apparatus.

Accordingly, it is a primary object of the present invention to provide an improved sewer flooding control system which is relatively free from maintenance and which prevents the adherence and accumulation of sewage to the sides and bottom of the sewage receiving base.

Another object of the present invention is to provide an improved sewer flooding control system with means to prevent sewage from entering the basement either as a result of the surging force of backup sewage or as a result of the length of time necessary to close the sewer valve when the level of sewage in the basement sewer is sufficiently high.

Also, it is an object of the present invention to provide a float of a construction which prevents easy shattering as a result of constant and repeated surging.

Another object of the present invention is to provide an improved sewer flooding control system with means to prevent sewage from forcefully contacting the float as a result of surging force of the backup sewage.

It is also an object of this invention to provide a float guide means which prevents contact between the float member and the side walls of the base.

A further object of the present invention is to provide a sewer flooding control system with a leak detector and a monitor system to afford maximum protection against flooding.

These and other objects and advantages of the invention will become apparent from the following description of the preferred embodiment and upon reference to the drawings and the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the entire sewer flooding control apparatus as it is installed, ready for use.

FIG. 2 is a partial sectional view of the base and main cylinder portion of the system.

FIG. 3 is a partial sectional view of the piston and flap valve apparatus.

FIG. 4 is a detailed perspective view of the four-way valve and the actuator arm connection.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, the preferred embodiment of the sewer flooding control apparatus **13** comprises a section of basement sewer pipe **10**, a base **11**, a cylinder **24** and a knife valve assembly **18**. The entire system is installed in a pit area **19** in the basement, so that the pipe section **10** and the base **11** is below the level of the basement floor **20**. The pipe section **10** is connected at one end to a basement sewer pipe **15** extending from the control apparatus **13** to the area which is to be drained (not shown), and is connected at the other end to a basement sewer pipe **16** extending from the apparatus **13** past the wall **21** to a street sewer (not shown). During normal conditions, when flooding conditions do not exist, the level of sewage in the street is below the basement floor level and thus sewage is drained from the basement through the pipes **15**, **10** and **16**, and into the street sewer. When flooding conditions exist, the level of sewage in the street sewer is higher than the basement level. Therefore, the normal flow of sewage is from the street sewer into the basement area. During flooding conditions, the system is actuated to prevent flow from the street sewer to the basement area.

The base **11**, having an opening **63** in communication with the top of the pipe section **10**, is secured tightly to the pipe **10** by means of a U-bolt **22** extending around the pipe **10**. A float **26** is contained within the base **11** and is designed to correspond with the sewage level in the street sewer. Under normal conditions, sewage flows through the pipe **10**, without entering the base, and into the street sewer. During flooding conditions, however, the high level of sewage in the street sewer causes sewage to back up through the opening **63** and into the base **11** and causes the float **26** to rise to its uppermost position, thereby actuating the knife valve assembly **18** to move toward a down or closed position.

A cylinder portion **24** extends above the base **11** and houses an activator rod **25** which extends from the float **26** contained in the base **11** past the cap **34** on top of the cylinder **24**. The float **26** and thus the rod **25** rise and fall in response to the level of the sewage in the base **11**, as will be described more fully later on, to actuate a conventional four-way valve **28** and thus the knife valve assembly **18**.

The knife valve assembly **18** as seen in FIG. 1, includes a piston housing **29**, support brackets **30**, and an adapter **31**. The adapter allows the knife assembly **18** to be connected to the sewer pipe **10** so that the flow of sewage through the pipe **10** may be prevented. During normal conditions the valve is in an "up" position, i.e., thereby allowing the sewage to flow from the basement to the sewer. During flooding conditions, the valve is in a "down" position, i.e., so that sewage may not back up from the street sewer into the basement.

A conventional leak detector **35** is positioned in a sump **36** to detect leaks in the system. An ordinary leak detector which can be used for this purpose is the "ENPO" 1600 series leak detector, which includes a submersible pump **38** and liquid level sensor **40**. When a leak occurs in the system, the leakage flows into the sump **36**. When the level of leakage in the sump **36** reaches a sufficient level, usually several inches, the sensor **40**, which is sensitive to the the level of liquid in the sump **36**, activates the pump **38** which then pumps the sewage in the sump through the pipe **39**, and back into the pipe **10**. When the level of the sewage in the sump **36** has been sufficiently lowered, the pump **38** is turned off by the sensor **40**. Even when the pump **38** is turned off, a sufficient level of liquid remains in the sump **36** to prevent the escape of sewer gas through the pipe **39** and into the basement.

A vent **41** is provided for the base **11** to allow any sewer gas to be vented out of the building. A vent connection **42** connects the base **11** to one branch of a Y **44**, which in turn is connected to a vent pipe **45** extending out of the building. A plug **46** and a rod **48** are connected to the downwardly extending portion of the Y **44** so that the vent pipe **45** may be anchored to the pipe **10** and so that it may be easily cleaned and drained.

Referring now to FIG. 2, the connection of the base **11** and the cylinder **24** to the pipe **10** may be seen. The side walls of the base **11** are substantially vertical and are fastened at the top to a bottom flanged portion **56** of the cylinder **24**. The bolts **58** positioned around the perimeter of the flanged portion **56** secure the portion **56**, a side wall flange **59**, and a gasket **52** therebetween in a tight relationship to effectively seal the base **11**.

The bottom portion of the side wall **60** slopes toward

the opening in the sewer pipe **10** and has been found to be very effective in preventing sewage, particularly that of a greasy consistency, from accumulating on the bottom side **60** and thereby preventing the system **13**, (FIG. 1) from operating properly. The applicant has found that the bottom side **60** should slope at an angle of at least forty-five degrees to prevent such accumulation.

The opening **63** at the bottom of the base **11** is in direct communication with a flanged opening **67** in the pipe **10**. A dome adapter clamp **65**, the bottom flange of the base **61**, and the bottom flange **73** of the anti-splash plate **62**, are held in a tight, sealed relationship, with gaskets **64**, **64** positioned therebetween by bolts **66**. The adapter clamp **65**, and thus the entire base and cylinder, are then secured to the flanged opening **67** in the pipe **10** with a gasket **51** positioned therebetween by means of the U-bolt **22** extending around the pipe **10**. With this arrangement, the sewage, under normal conditions, flows from the basement floor drain, through the pipe **10**, and into the street sewer. During flooding conditions, sewage backs up from the street sewer, through the opening **63**, and into the base **11** to raise the float **26**.

A baffle or anti-splash plate **62** is mounted immediately above the opening **63** and is supported by several rods **77** which in turn are secured to the flange **63**. The principal purpose of the plate **62** is to dissipate the surging force of the backup sewage and to serve as a support for the float guide **71**. As seen in FIG. 2, the outer circumferential edge of the plate **62** is in spaced relation to the sloping side **60** so that sewage is free to back up into the base and raise the float **26**. As a result of the anti-splash plate **62**, the up and down movement of the float **26** is gradual even though sewage may be surging through the opening **63**.

A float **26** is contained within the base **11** and has an outer plastic shell surface preferably made of polyethylene. The interior of the shell is filled with polyfoam to give the float durability and additional buoyancy. A center opening **69**, within the float **26** and defined by the wall **54**, extends between two metal ends **70**, **70** to slide over a float guide **71** which extends from, and is mounted to, the baffle **62**. The guide **71** guides the float **26** in its up and down movement and prevents the float **26** from being forced against the base walls **11**, **60** by the surging force of the sewage. The guide **71** is of a sufficient length so that when the float **26** is in its uppermost position, (when the gasket **72** is tightly sealed against the bottom **74**) the upper end of the guide **71** is still within a portion of the center opening **69**.

A resilient gasket **72** is secured on top of the metal end **70** at the top of the float **26** and is designed to engage the cylinder bottom wall **74** which separates and seals the base **11** and the cylinder **24**. An upstanding float guide tube **75** extends upward from the center of the bottom wall **74** and provides, at its bottom end, an insert for an activator rod guide **76**, positioned around the rod **25**, and immediately above the gasket **72**. When the float **26** is raised by the level of the sewage in the base **11**, the guide **76** moves into the lower end of the tube **75** to properly orientate and seat the gasket **72** against the bottom **74**, and to prevent the passage of any sewage into the cylinder through the tube **75**.

An inverted cup member **78** is carried by the activator rod **25** immediately above the top of the upstanding tube **75**, so that when the float **26** is in its lowest position, the bottom edges of the cup member **78** extend over and around the tube **75**, and terminate just above the bottom **74**. The top of the tube **75** is provided with a center opening **57** which serves as a guide for the rod **25**. Several holes **79** are contained in the walls of the tube **75** a short distance from the top to allow the water which collects in the cylinder **24** to drain into the sewer pipe **10**.

The combination of the upstanding tube **75** and the inverted cup **78** functions primarily as a sewer gas trap to prevent the escape of sewer gas from the base **11**, to the cylinder **24**, and into the basement. If this arrangement was not present, the sewer gas from the building and street sewer would freely pass through the base **11** and the cylinder **24**, and into the basement. However, by maintaining a sufficient level or water in the cylinder **24**, the escape of sewer gas is prevented. As seen, the holes **79** are positioned a spaced distance above the bottom of the cylinder **74**. Thus, the level of water in the cylinder **24** is maintained at this height, with the excess being drained through the holes **79** and into the base **11**. At all times during the movement of the float **26**, the bottom edges of the inverted cup **78** are immersed in the water in the cylinder **24**, so that the sewer gas passing up through the tube **75** and through the holes **79**, is prevented from escaping. In order for the cup **78** to be effective as a gas trap, the portion of the cup **78** extending below the holes **79**, when the float **26** is in its lowest position, must have a length greater than the distance of the travel of the float **26** between its lowest position and its uppermost position.

An integral funnel **80** is provided at the top of the cylinder **24** to receive drain water from the operation of the piston **29** (FIG. 1) by way of the tubing **84** and **85**. This water is then directed by the funnel **80** into the cylinder **24** to provide the level of water for the gas trap members **78** and **79**.

A cap **34** is provided at the top of the cylinder **24** to cover the cylinder and to provide a mounting base for a valve mounting bracket **86**. Both the cap **34** and the bracket **86** have a hole extending therethrough from the axial center of the cylinder **24** to provide a guide for the up and down movement of the rod **25**. A conventional four-way valve **28** is mounted to the bracket **86** along with several tubings whose function will be described later.

Referring now to FIG. 4, a conventional four-way valve **28** and the means for transferring the up and down movement of the rod **25** to the valve **28** is shown. A typical four-way valve is a Versa, VNH–4312. As can be seen, the rod **25** extends through the cap **34** and the bracket **86**, and well above the top of the cylinder **24**.

An actuator arm **88** has a single prong end **93** securely fastened to a pivotable member **89** of the valve **28**, so that when the arm **88** is pivoted in a vertical plane, the member **89** is pivoted, thereby controlling the operation of the four-way valve **28**. A bifurcated end **97** of the arm **88** extends past the rod **25** and is oriented so that the two prongs of the end **97** straddle the rod **25**. The distance between the two prongs is only slightly greater than the diameter of the rod **25**, thus the only possible movement of the arm **88** is vertical pivotal movement about the member **89**.

An actuator arm stop **90** is immovably secured to the rod **25** immediately above the bifurcated end **97**. Two additional stops **91** and **92** are mounted to the rod **25** below the two prongs of the arm **88**, with a coil spring **94** positioned therebetween. Both of the stops **90** and **91** have a diameter greater than the distance between the prongs of the bifurcated end **97**, so that vertical movement of the rod **25** will cause the actuator arm **88**, acting through the stops **90** and **91**, to be urged toward respective pivotal movement about the member **89**. The stop **92** is securely mounted to the rod **25** and serves as a base for the coil spring **94**. The stop **91** is slidably mounted on the rod **25** immediately above the spring **94** and immediately below the arm **88**. The stops **90**, **91** and **92** serve to transfer the up and down movement of the rod **25** to the arm **88**, so that when the rod **25** moves up, the stops **91** and **92** and the spring **94** causes the arm **88** to pivot upwards about the member **89**. When the rod **25** moves down, the stop **90** causes the arm **88** to pivot downwardly about the member **89**.

The spring **94** positioned between the stops **91** and **92** allows for limited upward movement of the rod **25** without any pivotal movement of the arms **88**. Thus, a limited

amount of surging may occur in the base **11** (FIG. 2), thereby causing a small upward movement of the float **26** (FIG. 2) and the rod **25**, without causing the arm **88** to move. In addition, the spring **94** serves as a cushion to prevent the sudden jarring of the actuator arm **88** as a result of the sudden upward movement of the rod **25** due to rapid flooding or extensive surging.

The operation of the four-way valve **28** controls the flow of water from the tubing **55** to either of the tubings **81** or **82**. In this manner the movement of the piston **99** (FIG. 3) may be controlled. The tubings **84** and **85** are associated respectively with the tubings **81** and **82** to act as outlets for water passing from the tubes **81** and **82**. The actual function of each tubing will be described more fully when the operation of the entire control system is discussed. The valve **28** also serves to direct the spent water from the piston **29** (FIG. 1) into the funnel **80** to be used in cooperation with the gas trap apparatus, the tube **75** and the cup **78** (FIG. 2), as previously discussed.

The tubing **55** contains water under normal tap water pressure and extends into the valve **28** to eventually connect with either of the tubings **81** or **82**. A spigot **83** is connected into the tubing **55** with a piece of plastic tubing **87** leading from the spigot **83** to the leak detector sump **36** (FIG. 1). The purpose of this arrangement is to allow someone to periodically check the level of the water in the sump **36**, and if necessary, run some water into the sump so that it is at a sufficient level. Often, the leak detector **35** is not called upon to operate for several months either as a result of no flooding conditions or as a result of no leaks in the base **11**. When this happens, the level of water normally maintained in the sump **36** evaporates, thereby allowing sewer gas to back up into the basement. By periodically checking, the level of water in the sump **36** may be maintained by turning the spigot **83** to allow water to flow through the tube **87** into the sump **36**.

Referring to FIG. 3, the construction of and the relationship between the knife valve assembly **18** and the flap valve assembly **95** may be seen. The piston housing **29** along with the upper and lower end plates **96** and **98** combine to form a piston chamber which houses a piston **99** and consists of an upper and lower portion **100** and **101**. The entire construction including the housing **29** and end plates **96** and **98** is supported by the stand or support bracket **30** which extends from the pipe **10** to the bottom plate **98**, and is further supported by means of a piston stand **102** and a band clamp **104** extending around the cylinder **24**.

The piston **99** is mounted to the end of a piston rod or push rod **105** which extends from the piston **99** to the knife valve **106**. As can be seen from the partially broken away view of the piston housing **29** in FIG. 3, the size of the upper and lower chambers **100** and **101** changes with the relative vertical position of the piston **99**. Passageways **108** and **109** are contained in the upper and lower end plates **96** and **98** respectively so that the chambers **100** and **101** are respectively in communication with the tubings **81** and **82**. The tubings **81** and **82** extend from the passages **108** and **109** to the four-way valve **28** of FIG. 4.

The vertical movement of the piston **99** is a result of the flow of water, under normal tap water pressure, flowing from either of the tubings **81** or **82** into their respective chambers **100** and **101**. When water flows from the tubing **81** into the chamber **100**, the piston **99** is forced downwardly thus causing the rod **105** to move the knife valve into a closed position. At the same time, the water in the chamber **101** is being forced out through the tubing **82** to accommodate the downward movement of the piston **99**. When the water flows into the chamber **101** from the tubing **82**, the above process is reversed. The piston **99** and rod **105** are moved upwardly as a result of the tap water pressure in the chamber **101**, causing the knife valve **106** to move to an open position and the water in the chamber **100** to be forced out through the tubing **81**. After the valve **106** has assumed its "open" position, it is maintained in this position, along with the piston **29** and the rod **105** by the normal water pressure in the chamber **101**. In the preferred embodiment of FIGS. 1 and 3, the piston **29** is located above the building pipe **10**.

The lower portion of the knife valve assembly **18** is connected to the sewer pipe **10** by means of an adapter **31** and a pair of flange portions **110** of the pipe **10**. The adapter **31** and the flange portions **110** are held in a tight sandwich relationship by bolts **111** to effectively seal the pipe **10** and to allow the knife valve **106** to properly move between an open or closed position to thereby permit or prevent the passage of sewage through the pipe **10**.

The flap valve assembly **95** is located a short distance from the knife valve assembly **18** and includes a clean-out T **112**, a flap valve seat **114**, and a flap plate **115**. The T **112** has one end connected to the pipe **15** which extends to the basement drain (not shown), and another end connected to the pipe **10** which extends to the street sewer (not shown). The end connected to the pipe **15** has a thickened portion **116** which terminates in a shoulder portion **118**. The shoulder **118** provides a mounting surface for the flap valve seat **114** which in turn provides a seat for the flap plate **115**. The seat **114** is leaded into the shoulder **118** so that when the flap plate **115** is hanging free, a slight opening is present between the plate **115** and the seat **114**. The position of the plate **115** in FIG. 3 is the position it assumes when sewage is flowing from the basement under normal conditions.

A hinge **119** to pivotally mount the plate **115** is provided at the uppermost part of the seat **114** in a position which does not interfere in any way with the passage of sewage through the pipe **10**. The pivotal mounting allows the plate **115** to hang freely and to allow a normal flow of sewage through the valve **95** in a direction from the basement to the sewer. The purpose of the valve assembly **95** is to prevent the sewage, due to surging, from moving through the pipe **15** and splashing up through the floor drain (not shown) and into the basement. With the presence of the flap valve **95**, the surging force of the sewage is dissipated, thereby preventing the surge from entering the basement.

A clean-out cover **120** is fastened to a flange portion **121** on the T branch of the T **112**. By removing the cover **120**, the pipe in the area of the valve **95** may be cleaned and any repair or maintenance of the plate **115** or seat **114** may be taken care of.

The operation of the sewer flooding control system may best be seen by general reference to FIG. 1 and particular reference to FIGS. 2, 3 and 4. Referring first to FIG. 1, when the level of the sewage in the street sewer is lower than the pipes **15**, **10** and **16**, the sewage flows normally from the basement to the sewer. In this condition the knife valve (FIG. 3) is in an open position. When the sewage level in the sewer rises to a level above that of the basement floor **20** the tendency is for the sewage to back up through the pipes **15**, **10** and **16** and into the basement. However, the operation of the control system **13** prevents such basement flooding as hereinafter described.

When flooding conditions exist, the sewage backs up from the sewer into the base **11** to raise the float **26**. As the float **26** is raised, the rod **25** is likewise raised causing the actuator arm **88** (FIG. 4) to be pivoted upward. When the float **26** reaches its uppermost position so that the gasket **72** is sealed against the bottom **74**, to prevent sewage from passing into the cylinder **24**, the arm **88** is also in its highest pivotal position. When the arm **88** is in this position, the four-way valve **28** is moved to a position wherein water is caused to flow from the tubing **55** into the tubing **81**.

As the water passes from the tubing **81** through the passage **108** and into the chamber **100** (FIG. 3), the piston **99** is caused to move downward, thereby causing the push rod **105** and the knife valve **106** to be moved into a closed position. When the knife valve is in this position, sewage is prevented from flowing from the sewer into the basement. Also, as the piston **99** is moving downward, the water in the chamber **101** is forced through the passage **109** and the tubing **82**, into the valve **28** (FIG. 4) and out through the tubing **85** to be directed into the funnel **80**.

When the flooding condition has subsided, the level of the sewage in the base **11** recedes, thereby causing the float **26** and the rod **25** to be lowered. As the rod **25** is lowered, the arm **88** (FIG. 4) is pivoted downwardly thereby resulting in the valve **28** being actuated in a manner which causes the water in the tubing **55** to be directed into the tubing **82**. When this happens, water passes through the passage **109** and into the chamber **101** thereby causing the piston **99**, the rod **105**, and the knife valve **106** to move upward to an open position. This position of the knife valve **106** allows sewage to again flow normally from the basement floor to drain the sewer. As the piston **99** is moving upward, the water is being forced out of the chamber **100**, through the tubing **81** and into the valve **28**. From here it is directed to the tubing **84** for drainage into the funnel **80**.

It is suggested that a monitor system may be provided in conjunction with the above-described embodiment so that particular information about the operating status of each of the functioning units of the system may be monitored to locations remote from the site of the control system. For example, the actuation of the four-way valve **28** (FIG. 4), the closing of the knife valve assembly **18** (FIG. 3), the operation of the leak detector **35** (FIG. 1), or the recognition of low or negative water pressure in the water supply system may be so monitored. This would allow a supervisor or other appropriate person to more easily know of the condition of the sewer (flooded or otherwise), without posting a constant vigilance at the site of the flooding control system.

This invention may be embodied in other forms not specifically shown in the preferred embodiment without departing from the spirit or essential characteristics thereof. The preferred embodiment is therefore to be considered as illustrative only, with the scope of the invention being indicated by the appended claims and their equivalents.

What is claimed and desired to be secured by the United States Letters Patent is:

1. An improved sewer flooding control system for selectively actuating a valve member into a closed and open position with respect to drainage through a basement sewer drain pipe so as to prevent the flooding of basements or other areas as a result of flooding conditions in the street sewer comprising:

a drain pipe extending between, and in communication with, the basement drain and the street sewer;

a valve member operatively positioned in said drain pipe, the valve member having an open position for allowing the normal flow of sewage from the basement drain to the street sewer and a closed position for preventing the backup of sewage from the street sewer toward the basement drain;

means contained within said drain pipe between the valve member and the basement drain for dissipating the surging force of backup sewage passing therethrough, said means having a valve seat integrally formed with the drain pipe and extending around the inner periphery thereof and a valve plate designed to be disposed against the valve seat to provide an effective seal in said drain pipe, the disposition of the valve plate against said valve seat resulting from the force of the backup sewage passing from the street sewer toward the basement drain;

a dome portion mounted to said drain pipe defining a first chamber for receiving a limited amount of sewage from the drain pipe, said dome portion having:

a bottom opening sealed to and in communication with the drain pipe so that sewage may pass from the drain pipe into said first chamber and assume a level in said first chamber equivalent to that of the sewage level in the street sewer,

a side wall with an upper portion having a circumference substantially greater than the circumference of said bottom opening and a lower portion having a lower end comprising an inwardly sloping surface extending from the upper portion to said bottom opening, the inwardly sloping surface designed to prevent the accumulation of sewage thereon, and

sealing means at the top of the dome portion for limiting the amount of sewage passing into said first chamber from the drain pipe;

a float contained within said dome portion and carried by a float rod for reciprocal vertical movement, the float having an outer diameter substantially less than the inner surface of said wall so that during the vertical movement of said float, the float is spaced from the inner surface of said side wall, said float being of sufficient buoyancy to rise and fall with the level of sewage in said dome portion, and thereby move the float into an upper and lower position, said upper position being defined by the position of the float in its highest position and said lower position being defined by the position of the float in its lowest position;

a plate member mounted between the float and the drain pipe, and immediately above said bottom opening, the size of the plate member being sufficient to dissipate the surging force of sewage passing through the bottom opening and into said first chamber, but spaced from said side wall to allow sewage to flow between the side wall and the plate and thereby cause the float to move to an appropriate position; and

means for controlling the position of said valve member in response to the rise and fall movement of the float so that when the float is in its upper position, the valve member is in said closed position, and when the float is moved away from its upper position, the valve member is in said open position.

2. The improved sewer flooding conrol system of claim **1** wherein said means for controlling the position of said valve member in response to the rise and fall movement of the float includes actuating valve means operatively connected between the float rod and said valve member in the drain pipe.

3. The sewer flooding control system of claim **2** and a float guide means including a vertical rod mounted to said plate member for guiding the float in its up and down movement.

4. The improved sewer flooding control system of claim **2** and means for operatively connecting said actuating valve means to the float rod including an actuator arm having a single prong end pivotally mounted to said actuating valve means and a bifurcated end whose two prongs straddle the float rod, and means for transferring the reciprocal movement of said float rod to the bifurcated end.

5. The sewer flooding control system of claim **4** wherein the sloping surface is disposed at approximately forty-five degrees with respect to the horizontal.

6. The sewer flooding control system of claim **5** and a float guide means including a vertical rod mounted to said plate member for guiding the float in its up and down movement.

7. The sewer flooding control system of claim 1 wherein the inwardly sloping surface of said side wall is disposed at approximately forty-five degrees with respect to the horizontal.

8. The sewer flooding control system of claim 1 and a float guide means mounted to said plate member for guiding the float in its up and down movement.

9. The sewer flooding control system of claim 8 wherein the float guide means includes a vertical rod.

10. The sewer flooding control system of claim 9 wherein the sloping surface is disposed at approximately forty-five degrees with respect to the horizontal.

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