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FLOOD CONTROL DEVICE

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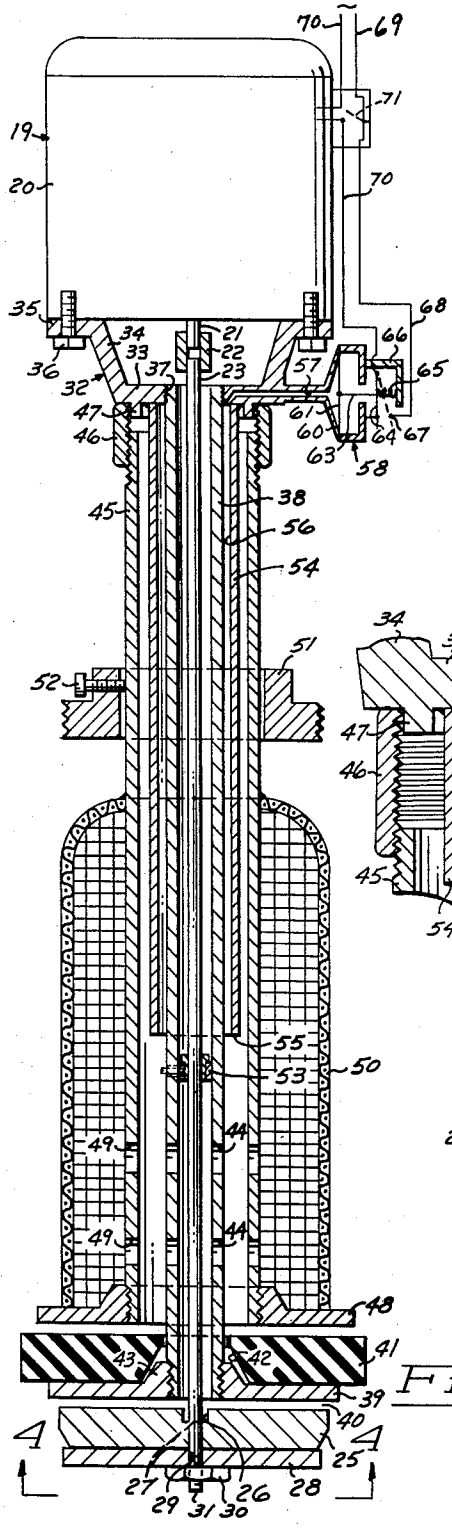


FIG 1

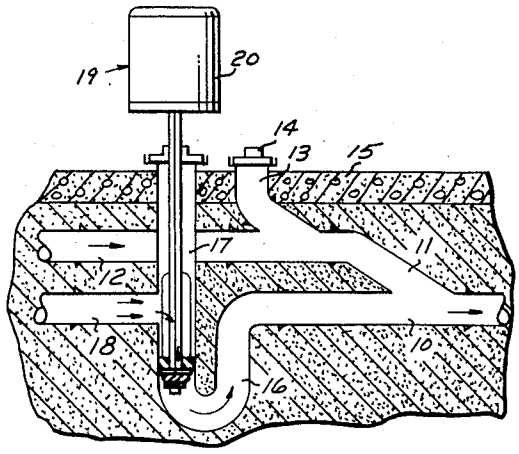


FIG 2

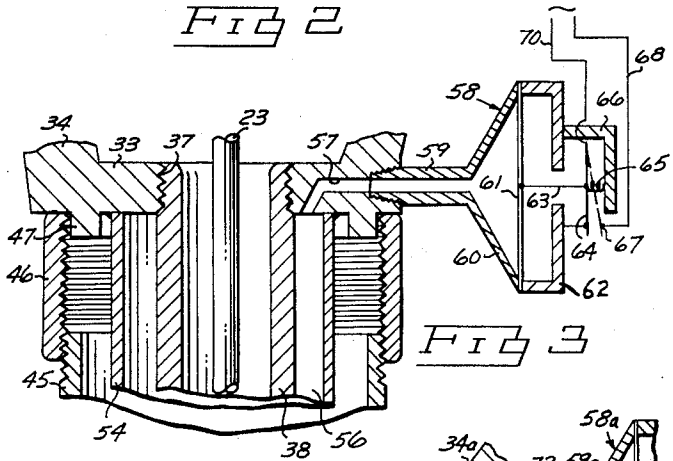


FIG 3

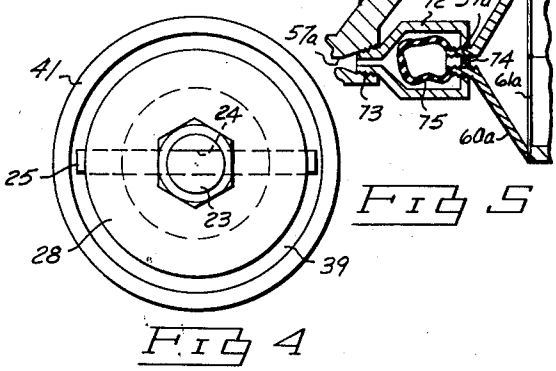


FIG 4

FIG 5

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FLOOD CONTROL DEVICE

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5 Claims. (Cl. 137—394)

This invention relates to a new and useful flood control device to prevent the flooding of basements during periods when the water will not flow away through a basement sewer system under the force of gravity and when water may even flow back into the basement from the main sewer.

It is an object of the invention to provide a flood control device adapted to be easily and quickly mounted in the storm sewer cleanout or riser of a basement sewer system without the need for any reconstruction of the basement sewer system.

It is another object of the invention to provide a flood control device incorporating a power driven vane or impeller which is constructed and arranged to be mounted in the storm sewer cleanout of a basement sewer system and adapted to force any water building up in the riser outwardly from the basement to the main sewer line so as to prevent outside water from flowing back into the basement sewer system and at the same time forcing out any seepage water which may collect behind the vane or impeller.

It is still another object of the invention to provide a flood control device which may be mounted in the storm sewer cleanout or riser at all times and which is provided with a control means for automatically actuating the device when water flows back into the basement sewer system from the main sewer line, and which is arranged and constructed to permit normal amounts of seepage water to be carried away by gravity in the usual way without the device being actuated under normal or no-flood conditions.

It is a further object of the invention to provide a flood control device which is compact and simple in construction, economical of manufacture and efficient in operation.

Other objects, features and advantages of this invention will be apparent from the following detailed description and appended claims, reference being had to the accompanying drawing forming a part of the specification wherein like reference numerals designate corresponding parts of the several views.

In the drawing:

Fig. 1 is an elevational sectional view of a flood control device embodying the principles of the invention;

Fig. 2 is a diagrammatic view, to small scale, of a conventional sewer system provided with the flood control device of the present invention;

Fig. 3 is an enlarged fragmentary elevational sectional view of the pressure operated switch means employed in the present invention;

Fig. 4 is a bottom end view of the structure illustrated in Fig. 1, taken along the line 4—4 thereof and looking in the direction of the arrows; and,

Fig. 5 is a fragmentary elevational sectional view of a modified pressure operated switch means adapted for use in the present invention.

Referring now to the drawings, Fig. 2 shows a conventional basement sewer system having a main line 10, leading outwardly to the street sewer in the usual manner. The line 10 is connected by means of the Y 11 to the branch line 12 which is provided with the usual cleanout or riser 13 which is normally closed by the usual externally threaded closure cap 14 at a point immediately above the basement floor 15. The line 12 normally functions to carry away all the sanitary sewerage of a building and is also connected to some of the basement inlets. Line 10 is also connected to the trap 16 which leads to the cleanout or riser 17 which is normally closed at the upper end thereof by means of a closure cap (not shown) similar to cap 14 and at a point immediately above the basement floor 15. The riser 17 is also connected to the usual storm and seepage tile line 18.

The aforedescribed basement sewer system is subject to flooding when the street sewer is overloaded, whereby, the sewerage in this system will back up. The main purpose of the flood control device of the present invention is to prevent such an occurrence of the backing up of the sewerage into the basement. Fig. 2 illustrates schematically the mounting of a unitary flood control device embodying the invention, as generally indicated by the numeral 19, in a basement sewer system.

Figs. 1, 3 and 4 of the drawing disclose a unitary flood control device adapted to be inserted into the riser 17 of the aforedescribed sewer system, and which is automatically operable as a unitary device for preventing flooding of a basement.

The flood control device 19 comprises the electric motor 20 having the downwardly extended vertical output or drive shaft 21 on the lower side thereof which is operatively connected by means of the shaft coupling 22 to the elongated drive shaft 23. As shown in Figs. 1 and 4, the lower end of the drive shaft 23 is provided with the vertical slot 24 for the reception of the plate-like vane or impeller 25. The vane 25 is notched on the upper edge thereof as at 26 so that the vane extends above the upper end 27 of the slot 24. A circular plate or washer 28 provided with the central aperture 29 is mounted on the lower end of the shaft 23 and is held in abutting engagement with the lower end of the vane 25 by means of the locknut 30 which is threadably mounted on the threaded lower end 31 of the shaft 23. The vane or impeller 25 and the plate 28 coact to provide what may be termed an impeller device or impeller means.

As shown in Figs. 1 and 3, the flood control device 19 includes a flange coupling generally indicated by the numeral 32 which is secured to the lower end of the motor 20. The flange coupling 32 includes the lower circular horizontal wall 33 from which extends upwardly and outwardly therefrom the tapered side wall 34 which terminates in the horizontal flange 35. The flange 35 is secured by a plurality of bolts 36 to the lower end of the motor 20. The shaft 23 extends downwardly through the threaded aperture 37 in the flange coupling wall 33.

As shown in Figs. 1 and 3, the shaft 23 is surrounded by the inner shaft housing or tube 38, the upper end of which is threadably mounted in the threaded aperture 37 in the wall 33. The tube 38 is provided on the lower end thereof with a threadably mounted presser ring plate 39 which is horizontally disposed and spaced above the vane 25 as indicated by the numeral 40. An expansible rubber ring 41 is disposed around the lower end of the inner shaft housing 38 and rests on the upper side of the lower presser member 39. The rubber ring 41 is provided with an upwardly tapered or conical central aperture 42 therethrough which mates with and receives the upwardly extended conical lip 43 on the upper side of the presser ring plate 39. As best seen in Fig. 1, the

inner shaft housing 38 is provided with a plurality of drain inlet openings or ports 44 adjacent the lower end thereof.

The flood control device 19 further includes the outer shaft housing or elongated tube 45 which is concentrically disposed around the inner shaft housing 38 and is laterally spaced therefrom. Threadably mounted on the upper end of the outer shaft housing 45 is the adjusting coupling 46 the upper end of which abuts the lower face of the wall 33 of the flange coupling 32. The spacing between the shaft housings 38 and 45 may be maintained by any suitable spacing means as by means of the annular integral projection or spacer ring 47 which depends from the lower face of the flange coupling wall 33. An upper horizontal presser ring plate 48 is threadably mounted on the lower end of the outer shaft housing 45. The outer shaft housing 45 is provided with a plurality of drain inlet openings or ports 49 adjacent the lower end thereof and in alignment with the inlet openings 44 in the inner shaft housing 38. As shown in Fig. 1, a screen strainer 50 is fixedly mounted around the lower portion of the outer shaft housing 45 with its lower end resting on the upper face of the presser ring 48. As shown in Fig. 1, a mounting ring 51 is adjustably secured around the outer shaft housing 45 and is threaded on the lower periphery thereof so as to be threadably mounted in a sewer cleanout or riser in the same manner as the usual cleanout plug. The mounting ring 51 is provided with a locking screw as 52 for securing the flood control device therethrough. As shown in Fig. 1, a suitable bearing means as 53 is mounted inside of the inner shaft housing 38 for journalling the lower end of the drive shaft 23.

As shown in Figs. 1 and 3, the control means for automatically operating the flood control device includes the level control tube 54 which is concentrically mounted around the inner shaft housing 38. The level control tube 54 extends downwardly to a point adjacent the upper inlet openings 44 as indicated by the numeral 55. The upper end of the level control tube 54 is fixedly mounted to the flange coupling wall 33 by any suitable means, as by welding. The space 56 between the level control tube 54 and the inner shaft housing 38 communicates at the upper end thereof with the air channel 57 formed in the flange coupling wall 33 as best seen in Fig. 3. The outer end of the air channel 57 is connected to a pressure switch generally indicated by the numeral 58. The pressure switch 58 includes the conduit 59 the outer end of which is threadably mounted in the outer end of the channel 57 and the inner end of which is integrally connected to the diaphragm chamber 60. The chamber 60 is enclosed by the diaphragm 61 which is made from a suitable flexible material and which is held in place by means of a suitable retainer member as 62. Fixedly connected to the outer face of the diaphragm 61 is the switch arm 63 the outer end of which is adapted to abut the switch blade 64. The switch blade 64 is held in the normally open position, as shown by the solid line in Fig. 3, by means of the return spring 65. The spring 65 is operatively supported by any suitable means as by the support arm 66. When the water level in the riser raises to a point high enough to enclose the lower end 55 of the level control tube 54, the air trapped within the tube will be put under a slight pressure so as to cause the diaphragm 61 to be flexed to the right as viewed in Fig. 3 so as to move the switch blade 64 to the dotted position as shown in Fig. 3. This action will cause the switch blade 64 to connect the electrical contact 67 and to actuate the drive motor 20 through the conductors 68, 69 and 70 which are connected to a suitable source of electrical energy. The motor 20 may also be manually set in motion by means of a suitable manually operated switch as 71.

In use, the flood control device 19 would be mounted in the riser 17 with the impeller disposed below the seepage line 18. The adjustable coupling 46 would then be rotated by means of a suitable wrench so as to move the outer shaft housing 45 downwardly to cause the upper presser ring 48 to engage the upper face of the rubber block or ring 41 to expand it outwardly into engagement with the inner surface of the riser 17. The expansion of the rubber ring 41 into engagement with the riser 17 fixes the lower end of the flood control device in place and prevents vibration and possible reverse flow of the water when the impeller 25 is actuated. The mounting ring 51 is then threaded in place in the upper end of the riser 17 and is then locked in place relative to the outer shaft housing 45 by means of the lock screw 52. In a basement sewer system provided with the flood control device 19, all of the basement inlets connected to the sanitary line 12 would be plugged by any suitable means. With the flood control device 19 mounted in a basement sewer system as aforedescribed, it is ready for automatic operation whenever flood water may back up into the basement through the line 10. When water backs up into the riser 17 and causes the air inside of the control level tube 54 to be compressed, as aforedescribed, the pressure switch means 58 would automatically start the electric motor 20 which will in turn drive the impeller 25 so as to force the water outwardly through the line 10 and into the street sewer. When the water level in the outer shaft housing 45 drops the pressure switch 58 will operate to shut-off the motor 20 and return the flood control device 19 to the standby condition. When in a standby position, it will be seen that seepage water may flow from the seepage line 18 and through the strainer 50 and through the inlet ports 49 and 44 into the inner shaft housing 38. The seepage then flows downwardly and out the lower end of the inner shaft housing 38 and out through the trap 16 into the line 10. Experience has shown that the flood control device of the present invention is very efficient in operation and economical to make and easily assembled in place without the need for any special tools or reconstruction of the basement sewer system. The vane 25 and the plate 28 function to provide an efficient impeller means for creating a pressure in the riser 17 to force out any outside water which may flow into the basement sewer system.

Fig. 5 shows a modified pressure switch means and the structure shown in Fig. 5 which is similar to the structure shown in Figs. 1 through 4 is marked with similar reference numerals followed by the letter "*a*." The modified pressure switch means includes an intermediate chamber 72 between the air channel 57*a* and the pressure switch 58*a*. The chamber 72 is provided at one end with the conduit 73 which is threadably mounted in the outer end of the conduit 57*a*. The conduit 59*a* of the pressure switch 58*a* is threadably mounted into the other end of the chamber 72. An air orifice 74 is provided inside of the conduit 59*a* and connects the chamber of the pressure switch with the inside of the flexible rubber bag 75 which is fixed onto the outer end of the conduit 59*a* in a sealing engagement therewith. The modified switch means of Fig. 5 functions in a manner similar to the switch means 58. The only difference is that instead of the air trapped in the level control tube 54 operating directly on the diaphragm 61*a*, it acts on the rubber bag 75 whereby the air inside of the bag 75 is compressed and is forced into the chamber 60*a* to flex the diaphragm 61*a*.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What I claim is:

1. A flood control device for use with a basement sewer system having a seepage sewer line connected to a riser provided with a floor cleanout opening, said device comprising: an inner elongated tube adapted to be inserted

into said riser through said opening; a motor mounted on the upper end of said inner tube; a drive shaft disposed in said inner tube and being operatively connected to said motor; an impeller means mounted on the lower end of said shaft and being spaced below the lower end of said inner tube; an extendable elongated outer tube mounted around said inner tube in a spaced concentric relationship; a mounting ring carried on said outer tube for positioning the upper end of the device in said riser; an expansible means mounted between said tubes and adapted to be expanded outwardly sidewardly when said outer tube is extended for clamping engagement with the inner surface of said riser; said elongated tubes having seepage inlet openings in the sides thereof; the lower end of said inner tube being open through which flooding water may enter and rise; and, control means operatively connected to said motor and inner tube for automatically starting said motor to actuate said impeller means in response to the water level in said riser.

2. The structure as defined in claim 1, wherein: said control means includes, a level control tube concentrically mounted around said inner tube in spaced relation between said inner and outer tubes; said level control tube extending downwardly to a point adjacent said inlet openings; the space between the upper ends of said inner tube and said level control tube being closed; a conduit communicating with the upper end of the space between said inner tube and said level control tube; an electrical circuit for energizing said motor; and, a pressure responsive switch operatively mounted in said conduit and being connected in said circuit, whereby, when the water level in said riser encloses the lower end of said level control

tube the air trapped in said level control tube will be put under pressure and said pressure will be transmitted to said switch for energizing said motor to actuate the device.

3. The structure as defined in claim 2, wherein: said pressure responsive switch includes a flexible diaphragm adapted to be directly operated on by the air trapped in said level control tube.

4. The structure as defined in claim 2, wherein: said pressure responsive switch includes a flexible diaphragm adapted to be indirectly operated on by the air trapped in said level control tube by means of an intermediately disposed rubber bag.

5. The structure as defined in claim 2, wherein: said impeller means comprises a vertical vane mounted on the lower end of the drive shaft; and, a circular plate mounted on the drive shaft below said vane and in abutting engagement therewith.

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