

## **DRAINAGE SYSTEM FOR MULTI-STORY BUILDING**

### **FIELD**

The disclosure relates to a drainage system for a multi-story building.

5

### **BACKGROUND**

In a multi-story building, many drainage pipelines are embedded in a floor panel between two adjacent floors. If there is water leakage on the pipeline of one of the floors, it is necessary to conduct repair of the leakage on the ceiling of the floor below the leaking floor so as to solve the problem of water leakage. That is, when there is water leakage on an upper floor, the repair construction is made on a lower floor, thereby causing disturbance on or intrusion into the resident of the lower floor.

15

### **SUMMARY**

Therefore, an object of the present disclosure is to provide a drainage system that is capable of alleviating at least one of the drawbacks of the prior art.

20

Accordingly, a drainage system of this disclosure includes a base floor panel, a drainage unit and a filler. The base floor panel has a panel top surface, and an accommodation groove formed on the panel top surface. The drainage unit includes a drain manifold disposed in the accommodation groove, and a pipeline assembly

25

connected to the drain manifold. The drain manifold has a height not exceeding a depth of the accommodation groove, and defines a receiving space. The drain manifold has a manifold top surface, and a water inlet hole formed in the manifold top surface and communicating with the receiving space. The filler is disposed in the accommodation groove, and covers the drainage unit. The water inlet hole is exposed from the filler.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the disclosure will become apparent in the following detailed description of the embodiments with reference to the accompanying drawings, of which:

FIG. 1 is a fragmentary perspective view of a drainage system according to the first embodiment of the present disclosure;

FIG. 2 is a view similar to FIG. 1, but without a filler;

FIG. 3 is a fragmentary partly sectional view of the first embodiment;

FIG. 4 is an enlarged fragmentary sectional view of the structure of a waterproof layer of a base floor panel of the first embodiment;

FIG. 5 is a perspective view of a drain manifold of the first embodiment;

FIG. 6 is a fragmentary partly sectional view of a drainage system according to the second embodiment of the present disclosure;

5 FIG. 7 is a fragmentary partly sectional view of a drainage system according to the third embodiment of the present disclosure; and

FIG. 8 is an exploded perspective view of a drain manifold and an extension member of the third embodiment.

10

#### **DETAILED DESCRIPTION**

Before the present disclosure is described in greater detail, it should be noted herein that like elements are denoted by the same reference numerals throughout the disclosure.

15

Referring to FIGS. 1 to 3, a drainage system according to the first embodiment of the present disclosure is suitable for use in a multi-story building, and is suitable for mounting on a floor panel between two adjacent floors. The drainage system of this disclosure includes a base floor panel 1, a filler 2, and a drainage unit 3.

20

25

The base floor panel 1 has a panel top surface 11, an accommodation groove 12 formed on the panel top surface 11, and a panel bottom surface 13 opposite to the panel top surface 11. In this embodiment, the base floor panel 1 includes a concrete layer 101 and a

waterproof layer 102 formed on the concrete layer 101. As shown in FIG. 4, the waterproof layer 102 includes a bottom coat layer portion 1021 formed on the concrete layer 101 and made of a resin material, a putty layer portion 1022 formed on the bottom coat layer portion 1021 and made from a mixture of adhesive resin and putty powder, a glass fiber layer portion 1023 formed on the putty layer portion 1022 and made from a mixture of a resin material and a glass fiber mat #300, and a top coat layer portion 1024 formed on the glass fiber layer portion 1023 and made of a resin material. The panel top surface 11 is a top surface of the top coat layer portion 1024, but is not limited thereto. The concrete layer 101 of this embodiment is made of a high-strength concrete material having a compressive strength of 4000 PSI (Pound-force per Square Inch), but is not limited thereto. The thickness of the base floor panel 1 is, for example, 25 cm, but is not limited thereto. The depth of the accommodation groove 12 is, for example, 10 cm, but is not limited thereto. In other embodiments, the depth of the accommodation groove 12 may be between 10 cm and 20 cm, as long as it is less than or equal to one half of the thickness of the base floor panel 1. The shape of the accommodation groove 12 in this embodiment is rectangular, but is not limited thereto, and may have other regular or irregular shape.

The filler 2 is disposed in the accommodation groove

12, and has a filler top surface 21 flush with the panel top surface 11. In this embodiment, the filler 2 is made of a concrete material having a compressive strength that is lower than that of the concrete layer 101 and that is between 1000 PSI and 2000 PSI, but is not limited thereto. The filler 2 is made of a low-strength concrete material, so that it can be easily removed using any known construction method. The material of the filler 2 is not limited to what is disclosed herein.

Assuming that the drainage system of this disclosure is disposed between a first floor and a second floor of the building, the panel bottom surface 13 of the base floor panel 1 serves as a part of a ceiling of the first floor, while the panel top surface 11 of the base floor panel 1 and the filler top surface 21 of the filler 2 serve as a part of the floor of the second floor.

The drainage system of this disclosure further includes a main floor panel 4 (see FIG. 3) disposed on the panel top surface 11 and the filler top surface 21 and made of tile or marble, but is not limited thereto.

Referring to FIG. 5, in combination with FIGS. 2 and 3, the drainage unit 3 includes a drain manifold 31 and a pipeline assembly 32 connected to the drain manifold 31.

The drain manifold 31 defines a receiving space 301 for receiving dirty water and impurities in the dirty water, and has a manifold top surface 311, a water inlet

hole 312, three water inlet connection portions 313, and a water outlet connection portion 314. The filler top surface 21 may be higher than or equal to the manifold top surface 311. In this embodiment, the manifold top surface 311 is exemplified as being slightly lower than the filler top surface 21, and is exposed therefrom, as shown in FIG. 3. The water inlet hole 312 is formed in the manifold top surface 311, and communicates with the receiving space 301. The water inlet hole 312 is configured to communicate with, for example, a shower drain 5 provided on the main floor panel 4 for allowing dirty water on the main floor panel 4 to flow through the shower drain 5 and the water inlet hole 312 and into the receiving space 301.

The water inlet connection portions 313 are angularly spaced apart from each other. Each water inlet connection portion 313 has a tubular shape, and defines a water inlet channel 302 communicating with the receiving space 301 for allowing dirty water in the pipeline assembly 32 to flow therethrough and into the receiving space 301. The water outlet connection portion 314 is angularly spaced apart from the water inlet connection portions 313, also has a tubular shape, and defines a water outlet channel 303 communicating with the receiving space 301 for allowing dirty water in the receiving space 301 to flow therethrough and out of the drain manifold 31.

It should be noted herein that, as shown in FIG. 3, the drain manifold 31 of this embodiment is fixedly disposed in the accommodation groove 12 of the base floor panel 1, and has a height of, for example, 9.5  
5 cm which is slightly less than the depth of the accommodation groove 12. Further, the manifold top surface 311 and the top surface of the concrete layer 101 (that is, the junction between the concrete layer 101 and the waterproof layer 102) have the same height.  
10 However, in other embodiments, as long as the height of the drain manifold 31 does not exceed the depth of the accommodation groove 12, any height thereof is acceptable. In other words, the drain manifold 31 should not protrude out of the filler top surface 21.

15 With reference to FIGS. 2, 3 and 5, the pipeline assembly 32 includes three water inlet pipelines 33 respectively connected to the water inlet connection portions 313, and a water outlet pipeline 34 connected to the water outlet connection portion 314.

20 Each water inlet pipeline 33 has an embedded portion 35 embedded in the filler 2 in a slightly inclined manner (see FIG. 3) and having a first end 351 connected to a corresponding one of the water inlet connection portions 313, and a second end 352 opposite to and higher  
25 than the first end 351. Through this, when dirty water flows into the second end 352 of the embedded portion 35 of any one of the water inlet pipelines 33, the

inclined configuration of the embedded portion 35 can aid in smooth flow of the dirty water from the second end 352 to the first end 351 of the embedded portion 35, and then to the water inlet channel 302 of the corresponding water inlet connection portion 313.

Specifically, the three water inlet connection portions 313 of the drain manifold 31 are respectively denoted by 313A for the first water inlet connection portion, 313B for the second water inlet connection portion, and 313C for the third water inlet connection portion, as shown in FIG. 5. Moreover, the three water inlet pipelines 33 of the pipeline assembly 32 are respectively denoted by 33A for the first water inlet pipeline, 33B for the second water inlet pipeline, and 33C for the third water inlet pipeline, as shown in FIG. 2. The embedded portions 35 of the first to third water inlet pipelines 33A, 33B, 33C are respectively denoted by 35A, 35B and 35C. It should be noted herein that, in this embodiment, the second water inlet pipeline 33B, apart from having the embedded portion 35B, further has an extension portion 36 connected to the embedded portion 35B and protruding upwardly out of the filler 2 (see FIGS. 1 and 2), but is not limited thereto.

Referring again to FIG. 2, the embedded portion 35A of the first water inlet pipeline 33A includes an adapter (A1) connected to the first water inlet

connection portion 313A, a water pipe (A2) having one end connected to the adapter (A1), and an elbow (A3) connected to the other end of the water pipe (A2) opposite to the adapter (A1). The adapter (A1) has the first end 351 of the embedded portion 35A, while the elbow (A3) has the second end 352 of the embedded portion 35A. In this embodiment, the elbow (A3) of the first water inlet pipeline 33A is configured to connect with a bathtub drain (not shown) for allowing dirty water from the bathtub to flow therethrough and into the drain manifold 31, but is not limited thereto.

The embedded portion 35B of the second water inlet pipeline 33B includes an adapter (B1) connected to the second water inlet connection portion 313B (see FIG. 2), a first water pipe (B2) having one end connected to the adapter (B1), a first elbow (B3) connected to the other end of the first water pipe (B2) opposite to the adapter (B1), a second water pipe (B4) having one end connected to the first elbow (B3), and a second elbow (B5) connected to the other end of the second water pipe (B4) opposite to the first elbow (B3). Further, the adapter (B1) has the first end 351 of the embedded portion 35B, while the second elbow (B5) has the second end 352 of the embedded portion 35B.

The extension portion 36 of the second water inlet pipeline 33B includes a water pipe 361 having one end connected to the second elbow (B5) opposite to the

second water pipe (B4), and an elbow 362 connected to the other end of the water pipe 361 opposite to the second elbow (B5). In this embodiment, the elbow 362 of the extension portion 36 is configured to connect with a washbasin drain port (not shown) for allowing dirty water on the washbasin to flow therethrough and into the drain manifold 31, but is not limited thereto.

The embedded portion 35C of the third water inlet pipeline 33C includes an adapter (C1) connected to the third water inlet connection portion 313C (see FIG. 2), a first water pipe (C2) having one end connected to the adapter (C1), a first elbow (C3) connected to the other end of the first water pipe (C2) opposite to the adapter (C1), a second water pipe (C4) having one end connected to the first elbow (C3), a second elbow (C5) connected to the other end of the second water pipe (C4) opposite to the first elbow (C3), a third water pipe (C6) having one end connected to the second elbow (C5) opposite to the second water pipe (C4), and a third elbow (C7) connected to the other end of the third water pipe (C6) opposite to the second elbow (C5). Further, the adapter (C1) has the first end 351 of the embedded portion 35C, while the third elbow (C7) has the second end 352 of the embedded portion 35C. In this embodiment, the third elbow (C7) is configured to connect with a floor drain 6 provided on the main floor panel 4 for allowing dirty water on the main floor panel 4 to flow therethrough

and into the drain manifold 31, but is not limited thereto.

In this embodiment, the water outlet pipeline 34 includes a water pipe 341 having one end connected to the water outlet connection portion 314 (see FIG. 2), and the other end connected to, for example, a drain riser 50. Through this, dirty water from the drain manifold 31 can be allowed to flow to the drain riser 50 through the water outlet pipeline 34 and be discharged out of the drain riser 50.

It should be noted herein that, in other embodiment, the number of the water inlet connection portion 313 of the drain manifold 31 may be one, two, or other number, and the number of the water inlet pipe 33 of the pipeline assembly 32 may correspond to the number of the water inlet connection portion 313, and may be one, two, or other number. Further, the configuration of each water inlet pipe 33 and each water outlet pipeline 34 may be adjusted according to actual requirement in other embodiment, and are not limited to what is disclosed herein.

Referring to FIG. 6, the second embodiment of the drainage system of this disclosure is shown to be substantially identical to the first embodiment. However, in this embodiment, the manifold top surface 311 of the drain manifold 31 is slightly lower than the top surface of the concrete layer 101, and the filler

2 defines a drain passage 201 communicating with the water inlet hole 312 (see FIG. 5) formed in the manifold top surface 311 of the drain manifold 31. The drain passage 201 is configured to communicate with, for example, the shower drain 5 of the main floor panel 4 so as to allow dirty water on the main floor panel 4 to flow therethrough and into the water inlet hole 312 of the drain manifold 31.

Referring to FIGS. 7 and 8, the third embodiment of the drainage system of this disclosure is shown to be substantially identical to the second embodiment. However, in this embodiment, the drain passage 201' is cooperatively defined by the filler 2 and the main floor panel 4, and the drainage unit 3 further includes an extension member 37 disposed in the drain passage 201' and connected to the drain manifold 31. In other words, the drain passage 201' of this embodiment is configured as a receiving space for receiving the extension member 37. The extension member 37 has a tubular shape, and defines an extension passage 371 communicating with the water inlet hole 312 in the manifold top surface 311 of the drain manifold 31 so as to allow dirty water on main floor panel 4 to flow into the drain manifold 31 through the extension passage 371.

In sum, by embedding a portion of each of the drain manifold 31 and the pipeline assembly 32 in the filler 2, if there is water leakage in the drainage unit 3,

the filler 2 is simply removed to perform repair of the drainage unit 3. There is no need to perform the repairing work on the floor below the leaking floor. Thus, the drainage system of this disclosure can indeed  
5 overcome the inconvenience of the prior art. Furthermore, the base floor panel 1 can simultaneously serve as a part of the floor of an upper floor and as a ceiling of a lower floor. Moreover, since the depth of the accommodation groove 12 is less than or equal  
10 to one half of the thickness of the base floor panel 1, when repair is performed on the drainage unit 3, work repair is made only on an upper portion of the base floor panel 1. As such, there is no causing of disturbance on or intrusion into the resident of the lower floor.  
15 Therefore, the object of this disclosure can indeed be achieved.

In the description above, for the purposes of explanation, numerous specific details have been set forth in order to provide a thorough understanding of  
20 the embodiments. It will be apparent, however, to one skilled in the art, that one or more other embodiments may be practiced without some of these specific details. It should also be appreciated that reference throughout this specification to "one embodiment," "an  
25 embodiment," an embodiment with an indication of an ordinal number and so forth means that a particular feature, structure, or characteristic may be included

in the practice of the disclosure. It should be further appreciated that in the description, various features are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of various inventive aspects.

While the disclosure has been described in connection with what are considered the exemplary embodiments, it is understood that this disclosure is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

**CLAIMS**

1. A drainage system, comprising:

a base floor panel having a panel top surface,  
and an accommodation groove formed on said panel top  
5 surface;

a drainage unit including a drain manifold  
disposed in said accommodation groove, and a  
pipeline assembly connected to said drain manifold,  
said drain manifold having a height not exceeding  
10 a depth of said accommodation groove and defining  
a receiving space, said drain manifold having a  
manifold top surface, and a water inlet hole formed  
in said manifold top surface and communicating with  
said receiving space; and

15 a filler disposed in said accommodation groove  
and covering said drainage unit;

said water inlet hole being exposed from said  
filler;

wherein the depth of said accommodation groove  
20 is less than or equal to one half of the thickness  
of said base floor panel, and is between 10 cm and  
20 cm;

wherein said base floor panel includes a  
concrete layer, and said filler is made of a concrete  
25 material having a compressive strength lower than  
that of said concrete layer, and is between 1000 PSI  
and 2000 PSI.

2. The drainage system as claimed in Claim 1, wherein  
said filler has a filler top surface higher than or  
equal to said manifold top surface, and defines a  
5 drain passage communicating with said water inlet  
hole.
3. The drainage system as claimed in Claim 1, wherein  
said drain manifold further has at least one water  
10 inlet connection portion defining a water inlet  
channel that communicates with said receiving space,  
said pipeline assembly including at least one water  
inlet pipeline connected to said at least one water  
inlet connection portion.
- 15 4. The drainage system as claimed in Claim 3, wherein  
said at least one water inlet pipeline has an  
embedded portion embedded in said filler in an  
inclined manner, said embedded portion having a  
20 first end connected to said at least one water inlet  
connection portion, and a second end opposite to and  
higher than said first end.
- 25 5. The drainage system as claimed in Claim 4, wherein  
said embedded portion includes at least one adapter  
connected to said at least one water inlet  
connection portion, and at least one water pipe

connected to said at least one adapter.

6. The drainage system as claimed in Claim 3, wherein said drain manifold further has a water outlet connection portion defining a water outlet channel communicating with said receiving space, said pipeline assembly further including a water outlet pipeline connected to said water outlet connection portion.

5

10

7. The drainage system as claimed in Claim 1, wherein said base floor panel further includes a waterproof layer formed on said concrete layer, said waterproof layer including a bottom coat layer portion formed on said concrete layer, a putty layer portion formed on said bottom coat layer portion, a glass fiber layer portion formed on said putty layer portion, and a top coat layer portion formed on said glass fiber layer portion.

15

20