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AIR SEPARATOR FOR DRAIN PIPES

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4 Claims. (Cl. 55—201)

The present application is a continuation of my application Serial No. 116,712, filed June 13, 1961 and now abandoned and entitled "Air Separator for Drain Pipes."

The present invention relates to an air separator which is particularly suited for drain pipes provided in buildings for the purpose of draining waste water discharged by toilets and bath tubs at several floors. After the compressible air water mixture has been compressed at the lower end of the drain pipe during the rapid flow of a high volume of liquid which occurs, for example, upon the flushing of a toilet, the air expands again when the flow is terminated and in doing so can cause displacement of the liquid contents in the siphon trap of a toilet and another sanitary fixture.

It is one object of the present invention to overcome this disadvantage by providing an air separator at the lower end of the drain pipe to prevent undesired pressure conditions in the drain pipe system.

Another object of the present invention is to provide an air separator in which a mixture of water and air flowing and falling in a vertical direction is transversely deflected to improve the separation of air from the flowing mixture of water and air.

With these objects in view, the present invention relates to a separator for separating air from a mixture of water and air. The separator is advantageously placed at the lower end of a vertical drain pipe which carries a mixture of air and water. According to one embodiment of the invention, the separator comprises an upper portion having an inlet for the mixture of water and air, and a first outlet for air, which is preferably horizontally spaced in one direction from the inlet. The lower portion of the separator has a second outlet for water which is preferably aligned with the inlet along a vertical axis. A guide means projects in the above mentioned direction into the space between the inlet and the second lower outlet so that the mixture of air and water cannot directly flow from the inlet to the lower second outlet but is deflected toward the region located below the first outlet for air. In this manner, air separates from the mixture and rises through the first outlet, while the remaining water flows downwardly toward the second lower outlet.

In the preferred embodiment of the invention, the guide means has an upwardly facing concave curved guide surface whose end is located substantially in the vertical axis along which the inlet and lower outlets are aligned.

Due to the deflection of the mixture of air and water from the vertical flow path, the flow is slowed down, and

guided transversely so that air bubbles can rise in a direction transverse to the flow of the water to pass through the upper outlet for air.

In the arrangement of the prior art, where the flow of the mixture of water and air takes place in a vertical direction, arising air bubbles meet the resistance of the dynamic pressure of the flowing water, and cannot readily separate from the water, as is the case in the arrangement of the present invention where rising air bubbles travel across the flow of water.

Furthermore, the deflection of the mixture of water and air creates turbulence by which the static pressure is reduced so that the formation of air bubbles, and its rising out of the liquid flow is again facilitated.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a vertical section illustrating an air separator according to the present invention;

FIG. 2 is a vertical section taken on line 2—2 in FIG. 1;

FIG. 3 is a side elevation showing a drain pipe system provided with a separator according to the present invention; and

FIG. 4 is a diagram illustrating the pressure variations in the drain pipe system of FIG. 3, corresponding points being shown at the same horizontal level.

Referring now to the drawings, and more particularly to FIG. 3, a vertical drain pipe has a plurality of drain pipe sections **10***a*, **10***b*, **10***c* which are connected to each other by connectors **11**. Each connector **11** has a lateral flange connected to a horizontal drain pipe **12** into which toilets or other plumbing fixtures **13** discharge. Solid material, such as excrements, toilet paper, and other discarded matter are contained in the waste water discharged from the horizontal pipes **12** into the vertical drain pipe.

When waste water is discharged into the drain pipe **10**, air is sucked into drain pipe **10**, and it is necessary to separate the air from the water at the lower end of the drain pipe. An air separator **14** according to the present invention is provided at the lower end of the last section **10***d*, and effects the separation of the air from the waste water. Air is discharged through the outlet **5**, while water flows through the outlet **6**.

Referring now to FIGS. 1 and 2, the separator has a housing **1** with an upper portion **2** and a lower portion **3**. An inlet means **4** is located on top of the housing, and is connected to a vertical drain pipe, as described with reference to FIG. 3. At the same horizontal level, and spaced a small distance from inlet **4**, a first outlet **5** is arranged through which air is discharged, as will be explained hereinafter. The lower portion **3** of casing **1** has a second lower outlet **6**, which is aligned along a vertical axis with the inlet **4**.

A substantially straight wall includes an upper portion **7***a* and a lower portion **7***b*, and is preferably semi-circular in a horizontal section. Another wall confronts wall **7***a*, **7***b* and has an upper straight portion **8***a*, preferably semi-circular in horizontal section, and a lower curved portion **8***b* which has a concave upwardly facing surface **8***c*. Wall portion **8***a*, **8***b* extends between the outlets **5** and **6**.

From a point between wall portion **7***a* and **7***b*, a guide wall means **7***c* projects downwardly into the lower portion of the separator. Guide wall **7***c* has an upwardly facing concave curved guide face **7***d* merging into the inner surface of wall portion **7***a*. The free end **7***e* of the guide wall **7***c* is substantially located at the vertical axis along which inlet **4** and outlet **6** are aligned, and guide surface