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SANITARY DRAIN SYSTEM, METHOD, AND FITTINGS THEREFOR

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ABSTRACT OF THE DISCLOSURE

A sanitary drain system, especially suited for tall buildings, which does not require a separate vent stack, is based on a special aerator branch fitting by which lateral drains are connected to the stack. The special fitting provides a mixing chamber with an outlet into the drain stack at its lower end. A lateral drain connection opens into the upper end of the mixing chamber directly above the outlet, and liquid entering through the lateral connection is directed vertically downwardly through the mixing chamber to the outlet. A stack inlet connection to the drain stack above opens into the mixing chamber alongside the lateral drain connection. Liquid flowing into the fitting through the lateral drain connection is highly aerated in the mixing chamber so as not to block the outlet connection to the flow of air down the stack. The complete drain system includes a deaerator fitting at the base of the stack, where air is disengaged from liquid at the point where it is delivered into a lateral sewer.

This invention relates to sanitary drainage, especially for tall buildings, and has for its principal object preventing the development of excessive negative (or positive) pressures in drain systems. The invention provides an improved method for achieving such object; and it further provides an improved sanitary system utilizing the method of the invention and an improved aerating connector fitting for use in such system. This application is a continuation-in-part of my copending applications Ser. No. 120,318, filed June 28, 1961, since abandoned, and Ser. No. 389,817, filed Aug. 5, 1964 and since matured into Patent No. 3,287,885, dated Nov. 29, 1966, the latter being a continuation of my application Ser. No. 116,712, filed June 13, 1961, now abandoned.

Sanitary drainage systems for all buildings comprise essentially a vertical drain stack of pipes through which liquid sanitary wastes (often admixed with solids) falls substantially vertically to a sewer pipe which runs laterally with only a gentle slope to enable the liquid to flow through it to the public sanitary sewer. The drain stack includes fittings at each floor by which lateral drain pipes for the floor are connected to the stack. Generally these fittings are simple T's. Sanitary appliances such as toilets, wash basins, sinks and baths are connected through traps to the lateral drain pipes, which, like the sewer pipe, are gently inclined from the appliance downwardly to the stack fitting. The trap associated with each fitting is simply a U-tube which is intended to be kept filled with water to prevent obnoxious sewer gases from escaping through the appliance drain into the surrounding atmosphere.

Simple as these systems are, in operation they present a problem which is neither simple to understand, nor easy or inexpensive to solve. The problem is that when a large volume of water is discharged in a short period of time into the system, such as by flushing a toilet, such discharge will create negative (below atmospheric) pressures within the system, both at the floor when the discharge occurs and at lower floors, which often reach magnitudes great enough to suck the water out of the traps of all the appliances on the affected floors. Such an occurrence is highly objectionable for it may result in the escape of objectionable and even hazardous amounts of sewer gas into the affected area. A concomitant effect is the creation of excessive positive (above atmospheric) pressures at floors near the base of the stack.

Conditions which cause excessive negative pressure to develop are generally well understood. The condition chiefly responsible is the blocking of the drain stack by the waste discharge when it flows from the lateral floor drain pipe into the stack, and the entrapment of air by falling water below this point of blockage. The blocking occurs because the momentum of the liquid waste flowing through the lateral drain pipe carries it across the diameter of the vertical drain stack, at the point of connection of the lateral drain pipe to the stack, before the force of gravity can change its course to a vertical fall. Thus at this point the drain stack remains blocked for so long as the discharge flows. Meanwhile the liquid that has entered the stack falls with the acceleration of gravity, and in doing so entraps air in the stack and carries it downwardly. Air cannot flow down the stack through the point of blockage as rapidly as air entrapped by the falling liquid is carried down below that point, with the result that substantial negative pressures are developed for several floors below the point of blockage. Correspondingly high positive pressures also customarily form at still lower floors. The negative pressures can easily obtain a magnitude of two to twelve inches of water, more than ample to empty all the traps on the floor of the discharge and on several floors below.

Two solutions to the above problem have been commonly used heretofore. One is to make the drain stack of substantially larger size than is necessary to carry the expected flow rates of discharged waste, and thereby reduce the blocking effect of the flowing water when it enters the drain stack. The other is to parallel the drain stack with a separate vent stack to which is connected the trap of each appliance, or the lateral drain pipe itself near the trap. The latter solution is particuluarly effective and is in fact required by many building codes. But both solutions are costly both in terms of the excess weight of piping required and in terms of the amount of plumbing labor required.

The present invention makes available a sanitary drain method and system that provides a new solution to the foregoing problem requiring no enlargement of the drain stack piping beyond what has been employed heretofore in vented systems, and requiring no separate vent stack or system. Thus the invention enables installing sanitary drain systems in tall buildings at substantially reduced costs in comparison with the system generally employed heretofore.

The method of this invention provides for preventing development of excessive negative (and positive) pressures in a tall sanitary drain stack into which liquid waste is discharged through lateral drain pipes, by directing such liquid waste vertically downwardly in a straight line path as it enters the drain stack, and strongly aerating such waste directly upon its entry into the drain stack by bring-