Nov. 30, 1954 M. A. SISK 2,695,677

SURFACE DRAIN

Original Filed Feb. 23, 1946 2 Sheets-Sheet 1

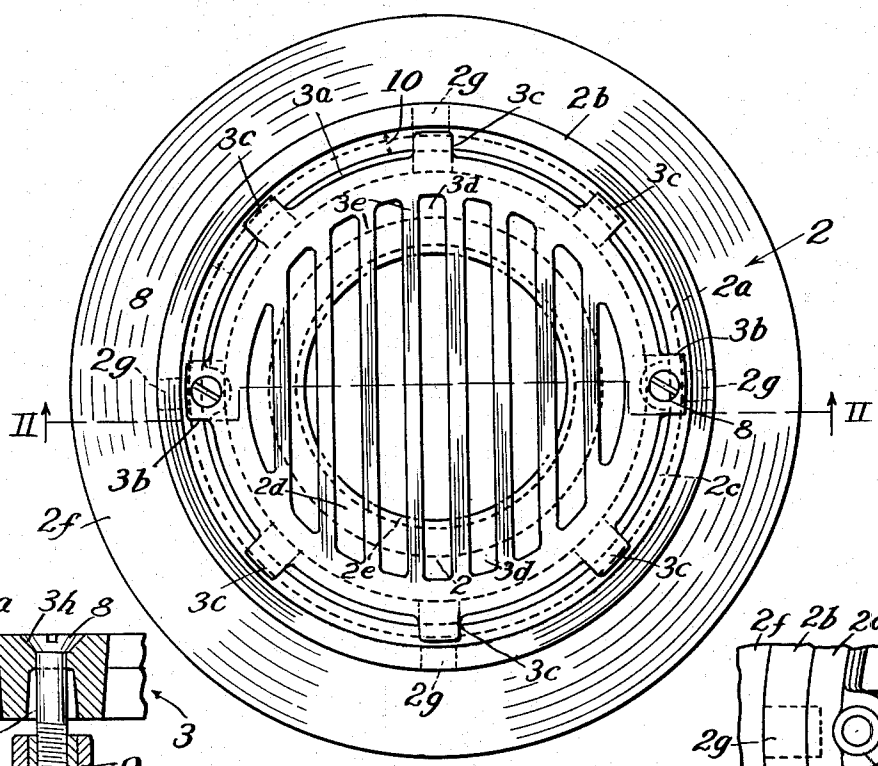


Fig. 1.

Fig. 3.

Fig. 4.

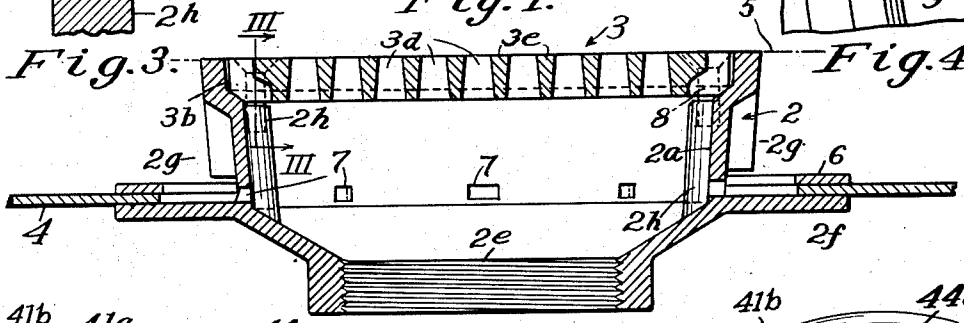


Fig. 2.

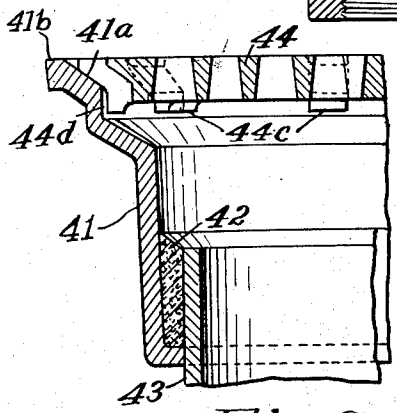


Fig. 6.

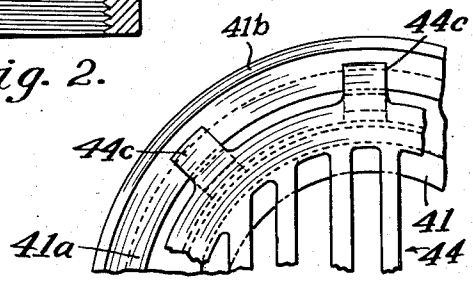


Fig. 5.

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SURFACE DRAIN

Original Filed Feb. 23, 1946 2 Sheets-Sheet 2

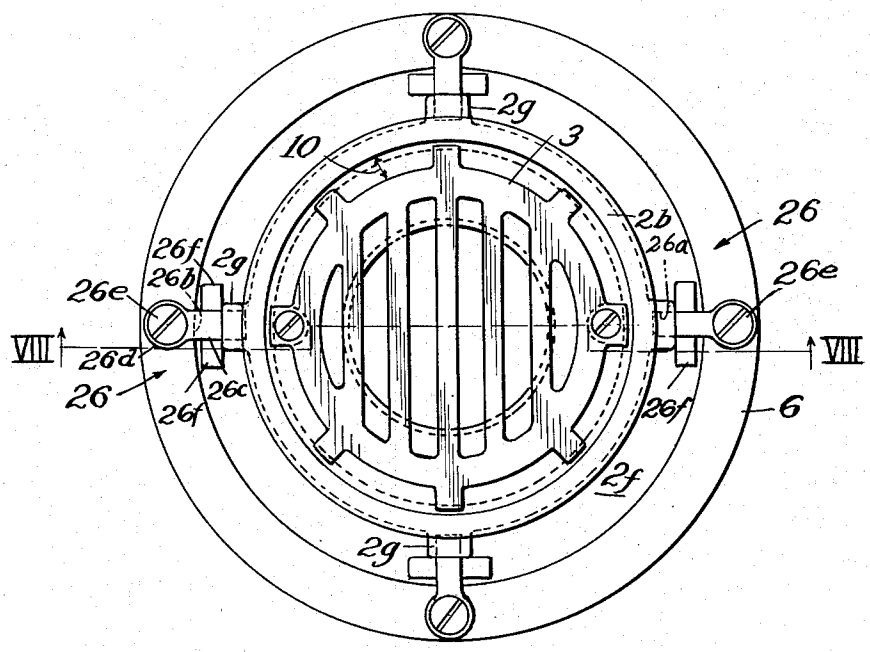


Fig. 7.

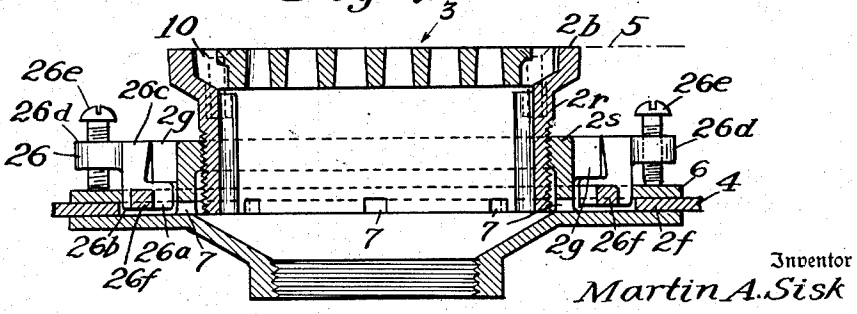


Fig. 8.

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2,695,677

SURFACE DRAIN

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Original application February 23, 1946, Serial No. 649,537, now Patent No. 2,607,434, dated August 19, 1952. Divided and this application July 20, 1950, Serial No. 174,935

3 Claims. (Cl. 182—31)

My invention relates to surface drains for use in the floors of shower baths, roadways, decks of ships, floors and roofs of buildings, and the like, to provide debris-excluding protection at the inlets of drain openings or pipes. The structure of the invention will also find utility as a guard for pipes and openings of any sort in which liquid is received, and in the operation of which it is desirable to exclude solids of a size that might clog the opening, or the pipe leading therefrom.

In general, an outlet or floor drain of the type in mind consists in a cup-shaped body that is embedded in the floor structure whose surface is to be drained, and the inlet of the body is covered by a removable grate whose upper face lies flush with such surface. The body of the drain forms a belled terminus at the end of a drain pipe laid beneath or within the floor structure.

In the usual prior structures the grate, consisting in a perforate plate of metal, rests at its periphery in a rabbeted seat formed in the rim of the cup-shaped body of the drain, and the greater part of the water entering the drain does so through holes or openings in the grate that are located inwardly from the rim of the drain body, with the result that the flowing water does not completely flush or wash the inner surface of the side wall of the drain body. Consequently, debris carried by the waste water tends to accumulate on such surface of the drain body, especially just below the grate, and between the seat and the edge of the grate. The accumulated debris over a period of time is subject to decomposition, creating foul odors and unsanitary conditions. In order to cleanse such drains, it is necessary to remove the grate and scrub or scrape away the accumulations—manifestly a disagreeable task. An important feature of this invention resides in the elimination of these objectionable conditions.

In accordance with this invention I provide a drain structure having a peripheral slot between the drain body rim and the edge or rim of the grate. This slot is effective substantially continuously throughout the periphery of the drain body inlet, and the internal surfaces of the drain body extend from this slot downwardly to the drain outlet, or to the inlet of the drain pipe on which the drain is mounted, providing a clear unrestricted downsweep for the flow of the draining water. No ledges, channels, or crevices are present in the structure, on which or in which debris may accumulate.

The application for this patent comprises a division of my application Serial No. 649,537, filed February 23, 1946 issued as Patent No. 2,607,434, August 19, 1952. Notice is also given of my copending application, Serial No. 174,936, filed July 20, 1950.

The invention will be understood upon reference to the accompanying drawings, in which:

Fig. 1 is a view in plan of a drain embodying the invention;

Fig. 2 is a view of the drain in vertical section, as seen on the plane II—II of Fig. 1;

Fig. 3 is a fragmentary sectional view, showing a detail of construction on the plane III—III of Fig. 2;

Fig. 4 is a fragmentary view on the scale of Fig. 3, illustrating a certain lug included in the drain body for receiving one of the screws that secures the grate of the structure to the body;

Fig. 5 is a fragmentary plan view of a drain that incorporates certain modifications of the structure shown in Fig. 1;

Fig. 6 is a fragmentary view in vertical section of the modified drain shown in Fig. 5;

Figs. 7 and 8 are views respectively corresponding to Figs. 1 and 2, illustrating still another modification in the drain structure of the invention.

Referring to Figs. 1 and 2 of the drawings the drain body 2 will be seen to comprise an integral casting, a casting of iron, ordinarily, having a generally cylindrical side wall 2*a* terminating in a rim 2*b* that defines the inlet of the drain. The rim is offset outwardly adjacent to the top of the side wall, to form a downwardly inclined seat 2*c* which extends in uninterrupted continuity around the periphery of said side wall. The inlet of the drain body is covered by grate 3, the grate being disposed within the inlet. Medially of its vertical extent the side wall is tapered inwardly, as at 2*d*, to a threaded opening 2*e* which forms the outlet of the drain, and provides for the attachment of the drain body to the threaded end of a drain pipe on the inlet side of the conventional trap (not shown). Extending laterally from the drain body is a circumferential flange 2*f*, and integrally cast on the outer surface of the portion 2*a* of the side wall are four lugs 2*g*.

At this point it may be mentioned that in lieu of the threaded outlet 2*e* the drain body may be shaped below the tapered wall portion 2*d* to form a bell-and-spigot joint with the terminus of the drain pipe, and, alternatively, the drain outlet may open laterally instead of downwardly through the wall of the drain body below the side wall portion 2*a*. These are details well known to the art.

In the installation of the drain in accordance with usual practice the upper portion of the drain body is arranged to extend upward through an opening in the membrane or flashing sheet 4 of lead or tar paper provided in the floor structure beneath the floor surface indicated at 5. The edge of the flashing sheet rests on the surface of flange 2*f*, and upon the edge of such flashing sheet a ring 6 is tightly secured (by conventional means, or by such means as those disclosed in my copending application Serial No. 649,537), forming a water-tight union of the flashing sheet with the flange 2*f*. Any water which might seep from the floor surface 5 downward between the drain body and the adjacent body of the floor, or which may leak through the body of the floor, is caught and drained through weep or seepage holes 7 into the drain body.

Turning now to a more detailed consideration of the features of the invention, it will be perceived that the grate 3 comprises a body having a peripheral edge 3*a*, from which two lugs 3*b* and six lugs 3*c* extend radially as shown in Fig. 1, and by means of which the grate is supported on the seat 2*c* as shown in Fig. 2. The grate will be seen to comprise a perforate plate enclosed by a rim, or may be said to comprise a perforated body encompassed by a horizontally extending plate-like rim or edge which is relatively thin with respect to the depth of the drain body above the outlet. Within the peripheral edge 3*a*, the body of the grate includes a system of slots 3*d* forming ribs 3*e*, and providing a perforate structure for the admission of drainage water and solids of permissible size. The two lugs 3*b*, arranged diametrically opposite, are each formed to receive a grate-securing screw 8 that extends downward through the lug into threaded engagement with a brass bushing 9 locked in a boss 2*h* integrally formed on the internal wall of the drain body. This provision of threaded brass bushings in the lugs 2*h* for the grate-securing screws 8 avoids the problem of the screws rusting tight in the cast iron body of the drain, thus insuring ready removability of the grate if the need arises.

In the drain structure described it will be perceived that the internal surface of the drain body side wall extends downward from the rim 2*b* in a series of smooth surface areas; that is, the surface above the downwardly sloped seat 2*c*, the surface of such seat, the surface of the side wall 2*a* below the seat and the surface of the inclined wall portion 2*d*. This vertical succession of internal side wall surfaces provides a continuous downsweep that is entirely unobstructed, having no recesses

nor ledges, it being noted that the two bosses 2*h* extend with smooth surfaces all of the distance from the grate lugs 3*b* to the inclined wall portion 2*d*. Hence, there are no restrictions or obstructions within the drain body upon which solids included in the drainage water can accumulate. Cooperating with this unrestricted downsweep form of the internal surface of the drain body is the provision of a flushing slot 10 which comprises a plurality or series of unobstructed and relatively long auxiliary slots disposed outwardly from the grate; the succession of auxiliary slots provides in practical effect a single slot that extends without interruption around the entire periphery of the inlet of the drain body, since the widely spaced, narrow lugs 3*b* and 3*c* do not interfere with the operation or functioning of the drain in the manner described below. As shown, the slot 10 is formed by and between the peripheral edge 3*a* of the grate body and the adjacent edge of the rim 2*b* of the inlet. The outer edge of this slot 10 is coincident or flush with the internal surface of the drain body, whereby water entering the drain body flows directly downward upon and around the entire periphery of the drain body, at the floor or drainage area level, and subjects all of the internal surface areas of the drain body, all of the way downward from the rim of such body, to an effective downsweep of water. All of the internal surface areas of the drain body are downwardly extending, and under the flushing flow of water it is impossible for the drain to become fouled by accumulations of dirt, grease or other sediment.

The peripheral slot 10 and system of openings 3*d* in the grate provide an effective inlet area that is substantially fifty per cent greater than usual, whereby greater than usual quantities of water can be handled in a drain of given size. If it is desired to flush out the drain pipe and trap with a bucket of water or a hose, it is not necessary, as it is in the prior structures, to remove the grate, since an adequate flow of water through the drain can be obtained to remove sediment from the drain pipe and trap, if indeed sediment collects therein when the drain of this invention is used. The drain serves substantially the same purpose as the more costly flushing rim drains that are provided with a hollow rim into which water is piped under pressure. Furthermore, the tapping of such flushing water from city supply lines is undesirable because it necessitates cross connections with the city supply, with the danger of back syphonage and contamination of the city water.

Another point may be mentioned. Since the grate 3 is supported by lugs located outward from the grate rim 3*a*, the tendency is negatived for the grate to tilt when pressure or load is applied to the rim of the grate. Indeed, the grate tends to seat tighter and to be more resistant to tilting when load is applied to its rim, located as it is within the limits of the points of support.

It will be noted that the grate-supporting lugs are of relatively small circumferential extent with respect to the intervening peripheral slots that form the peripheral or auxiliary slot 10. The grate-supporting lugs engage the drain body (on seat 2*c*) over relatively small areas, and the internal surface of the drain body between the narrow radial supporting lugs is sharply inclined downward all of the way from the top of the rim to the outlet. The outwardly extending radial lugs not only support the grate on the drain body, but space the grate with its rim away from the wall of the drain body.

The drain body is of a design which facilitates its production in a foundry. For example, the parting line of the mold in which the drain body is cast may be coincident with the top surface of the rim 2*b* on the drain body. The mold matrix portion which forms the outer surface of the drain body above the flange 2*f*, including the lugs 2*g* and the seepage holes 7 and the top of the flange 2*f*, may be provided by an appropriately shaped annular dump core of dry sand incorporated in the green sand rammed in the drag of the mold. The green sand in the cope forms the top edge of the rim 2*b* and the internal surfaces of the drain body from such rim downward to the outlet 2*e*, while the remaining portions of the mold matrix are formed in green sand in the drag of mold. The weep holes 7 are completely formed in the molding operation, by providing on the sand wall of the inner annular face of the dump core protuberances which are of the exact shape and arrangement of the weep holes to be formed in the side wall of the drain body. In the assembled mold, the inner ends of these molded sand protuberances on the annular dump core are adapted to lie flush against the surface of the molded sand of the cope that (when the metal is cast in the mold) forms the inner surface of the side wall of the drain body, while the bottom edges of such protuberances on the dump core lie flush with the bottom surface of the annular dump core that forms the top of the flange 2*f*, whereby in the casting operation the molten metal is blanked out within the regions in the mold matrix occupied by the protuberances, thus forming the weep holes in the side wall of the drain body, as shown.

The grate also is designed to be produced in a simple casting operation, the slots 3*d*, the peripheral edge 3*a*, and the sides of the lugs 3*b* and 3*c* all being drafted as indicated in Figs. 2 and 3, whereby the grate may be made in a simple two-part green sand mold having a parting line coincident with the top surface of the grate. Figs. 3 and 4 illustrate a detail of particular importance in the lugs 3*b* of the grate, these lugs serving not only to receive the grate-securing screws 8 but to provide grate-supporting members that rest on the seat 2*c* and cooperate with the lugs 3*c* in the support of the grate. Each lug 3*b* is recessed upwardly from its lower surface, as at 3*f*, Fig. 3, and in its upper face is provided with a conical socket 3*h* of the shape to receive the head of a screw 8, the apex of bottom of the conical socket extending through or almost through to the recess 3*f*. It will be seen that the slope of the face of the socket 3*h* and the sides of the recess 3*f* are such that the screw-receiving lugs 3*b* (as well as the rest of the grate structure) may be simply formed in the green sand mold and casting operations described. It is merely necessary, after the grate is cast, to drill or ream through such thin web of metal as may remain between the socket 3*h* and recess 3*f*, to provide the bore for a grate-securing screw. The recess 3*f* and the hole through which the screw passes is sufficiently larger than the body of the screw to permit the screw to be aligned or centered with the threaded bushing 9.

Figs. 5 and 6 illustrate a modification wherein the drain body 41 is designed for connection to the drain pipe 43 by means of a bell-and-spigot union 42, in lieu of the threaded connection (2*e*) employed in the structure of Figs. 1 and 2. In further modification the seat for the lugs of the grate may comprise an annular portion 41*a* that tapers downwardly immediately from and below the rim 41*b* of the drain body, to provide a seat for the correspondingly tapered lugs 44*c* of the grate 44. Grate-securing screws are not required in this structure, since the inherent security of the grate against tilting (due to the peripheral edge of the grate being located within the points of support) is augmented by the extension of the lugs 44*c* below the seat 41*a* and the contact of the lugs with vertical wall portions of the drain body, as indicated at 44*d*.

In order to make accommodation for variations in the thicknesses of the different floors in which the drains of the invention may be installed, the drain body may be constructed in two vertically telescoping body portions, as shown in Fig. 7 and 8. The drain shown in these figures is identical with the drain of Figs. 1 and 2, except that the body of the drain above the flange 2*f* is formed in two cylindrical portions 2*r* and 2*s*, threaded, as shown in Fig. 8, for telescopic axial adjustment. Manifestly, by rotating the upper body portion 2*r* the vertical interval between the flange 2*f* and the upper edge of the rim 2*b* may be regulated to bring the upper edge of the said rim to exact alignment with the plane 5 of the "finish" floor surface. The advantages of this adjustable drain body will be readily apparent, and it will be understood that this adjustable feature may be incorporated in any of the drain bodies described herein, in which the wall of the drain body immediately above the flashing flange (2*f*) is cylindrical.

The adjustable drain body incorporates, manifestly, the unrestricted internal wall construction for the downsweeping flushing action of water flowing through the substantially continuous slot 10 that is contiguous or flush with the internal surface of the drain body. That is, the adjustable drain body includes the primary structural features of the invention already described, and affords the advantages described. And so it is with the other forms of adjustable drain bodies described later in this specification.

The lugs 2*g*, appropriately shortened in vertical extent,

are provided on the lower portion 2*s* of the drain body which carries the flashing flange, and at this point will be considered the improved devices that cooperate with the clamping ring 6 for securing the edge of the flashing sheet 4 to the flashing flange of the body of any of the drains described. Such devices comprise clamps 26 of L-shape as viewed in side elevation (Fig. 8). A clamp is provided for each of the four lugs 2*g*, and each clamp is arranged with the toe portion 26*a* of its L-shaped body inserted beneath the associate lug, with the heel portion 26*b* of the L-shaped body positioned against the inner edge of the metal ring 6 that overlies the edge of the flashing sheet 4 on the flange 2*f*. Positioned outwardly from the top 26*c* of the L-shaped body of the clamp is a threaded eye 26*d*, through which a clamping screw 26*e* is run. Projecting laterally from the lower body portion of the clamp are two integral wings or lugs 26*f* which are adapted to prevent the clamp from tilting laterally while the screw 26*e* is being tightened against the top of the ring 6, as in fact it is after the clamp has been positioned in the manner described. Under the force created when the screw is tightened against the ring 6, the toe portion 26*a* of the clamp is caused to bear upward against the bottom of the lug 2*g*, the heel portion 26*b* is caused to bear outward against the inner edge of the ring, and the top 26*c* of the clamp is caused to bear inward against the face of the lug 2*g*. Thus, the clamp body is secure against all of the forces of reaction produced by turning the screw downward against the top of the ring 6. By so arranging a clamp with each of the four lugs 2*g* on the vertical side wall of the drain body, the ring 6 is caused to secure the edge of the flashing sheet 4 to the flange 2*f* in the desired manner. It will be noted of this simplified clamp structure that the lugs 2*g* are the only elements required therefor on the drain body, the need for the usual additional clamping lugs on the top of the flange 2*f* having been eliminated. An improved and simplified structure is thus realized, it being particularly noted that the lugs 2*g* comprise the only lugs required by the clamps, and these lugs can be provided by simply providing the dump core (used in the green sand mold) of proper shape. It will, of course, be understood that the clamps described may be used with any of the drain bodies described herein, where it is desired to secure a flashing sheet to a flashing flange on the drain body.

In all of the drain structures disclosed herein the general features of my invention will be found. My drain structure is self-cleansing, and to what has already been said I may add that the essential advantages of the costly flushing type drains are obtained in a relatively inexpensive construction which avoids the need of running pipes for flushing water to the drain installation.

In the several forms of the drain disclosed herein, the inlet of the drain body, and the grate covering the same, are shown to be arranged in horizontal position, but it will be understood that the inlets and grates of the various surface drain structures may be inclined to the horizontal, and/or may be of angular construction, as the well-known curb and corner drains are now constructed.

Other modifications and refinements will occur to those skilled in the art without departing from the spirit of the invention defined in the appended claims.

I claim:

1. In a surface drain comprising a drain body provided with a circular inlet having a rim adapted to lie flush with the surface to be drained, said drain body having a peripheral side wall extending downwardly from said rim to an outlet, and a grate supported on the drain body in position across the inlet; the invention herein described wherein the side wall of the drain body is formed with an internal surface that extends downwardly from the inner edge of said rim to said outlet, providing a continuous downsweep that is smooth and substantially unrestricted throughout the peripheral and vertical extents of said side wall, said grate comprising a disk-like body having within its peripheral edge a system of perforations for the drainage of liquid into said drain body, an annular downwardly sloping side wall portion on said drain body within and below said rim, said grate having a plurality of radial, circumferentially spaced lugs extending outwardly from the edge of the grate, said lugs being supported on said annular, downwardly sloping side wall portion of the drain body, with said peripheral edge of the grate flush with said rim and with the surface to be drained, and with said edge of the grate spaced at an interval inwardly from the adjacent edge of said rim of the drain body and forming therewith a relatively wide drainage slot that extends in substantial continuity throughout the periphery of said inlet, whereby in service the entire internal surface of the drain body is flushed by an unrestricted downsweeping flow of drainage liquid.

2. In a surface drain comprising a drain body provided with an inlet having a rim adapted to lie flush with the surface to be drained, said drain body having a peripheral side wall extending downwardly from said rim to an outlet, and a grate supported on the drain body in position across the inlet; the invention herein described wherein the side wall of the drain body is formed with an internal surface that extends downwardly from the inner edge of said rim to said outlet, providing a continuous downsweep that is smooth and substantially unrestricted throughout the peripheral and vertical extents of said side wall, said grate comprising a disk-like body having within its peripheral edge a system of perforations for the drainage of liquid into said drain body, an annular downwardly sloping side wall portion on said drain body within and below said rim, said grate having a plurality of radial, circumferentially spaced lugs extending outwardly from the edge of the grate, said lugs being supported on said annular, downwardly sloping side wall portion of the drain body, with the top surface of said peripheral edge of the grate flush with said rim and with the surface to be drained, and with said edge of the grate spaced at an interval inwardly from the adjacent edge of said rim of the drain body and forming therewith a relatively wide drainage slot that extends in substantial continuity throughout the periphery of said inlet, whereby in service the entire internal surface of the drain body is flushed by an unrestricted downsweeping flow of drainage liquid.

3. In a surface drain comprising a drain body provided with an inlet having a rim adapted to lie flush with the surface to be drained, said drain body having a peripheral side wall extending downwardly from said rim to an outlet, and a grate supported on the drain body in position across the inlet; the invention herein described wherein the side wall of the drain body is formed with an internal surface that extends downwardly from the inner edge of said rim to said outlet, providing a continuous downsweep that is smooth and substantially unrestricted throughout the peripheral and vertical extents of said side wall, said grate comprising a disk-like body having a ring-like periphery and having within such periphery a system of perforations for the drainage of liquid into said drain body, grate-seating means formed on the internal surface of said side wall of the drain body within and below the drain body rim, a plurality of lugs extending outwardly from the periphery of the grate and engaging said grate-seating means to support said grate with the top surface of its periphery in substantially a common plane with the rim of the drain body inlet and with the surface to be drained, said periphery of the grate being spaced at a substantial interval inwardly from the rim of the drain body to form a relatively wide drainage slot that extends in substantial continuity throughout the periphery of said inlet, whereby in service the entire internal surface of the drain body is flushed by an unrestricted, free, downsweeping flow of drainage liquid, and said grate-supporting means comprising said plurality of lugs, which lugs are relatively narrow, widely spaced and traverse said peripheral flushing slot and are effective below said rim of the drain body to support said grate without restriction of said flushing flow of drainage liquid.

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