Jan. 21, 1958 C. J. RODMAN 2,820,228

BATHTUB WITH REINFORCING MEANS

Filed July 1, 1957 3 Sheets-Sheet 1

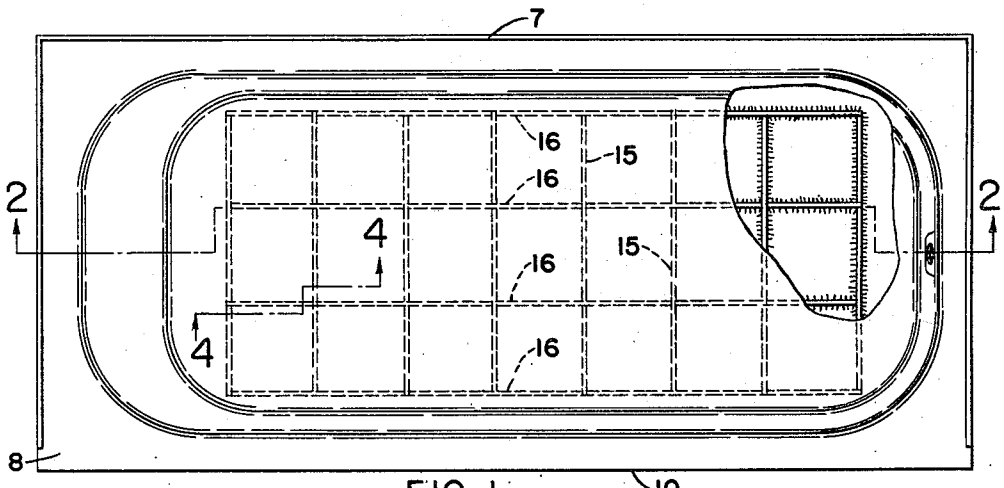


FIG. 1

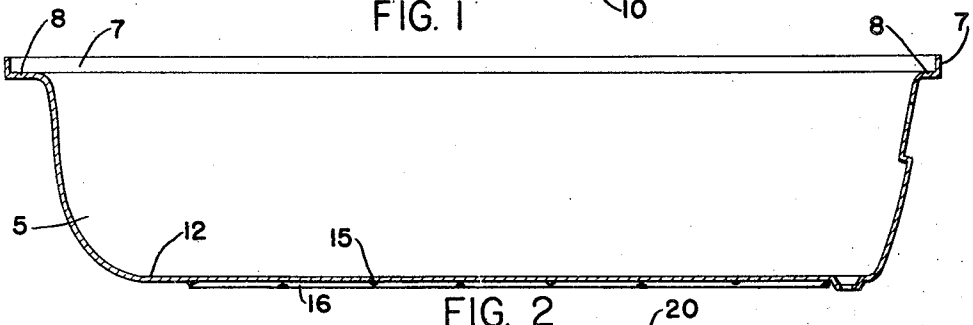


FIG. 2

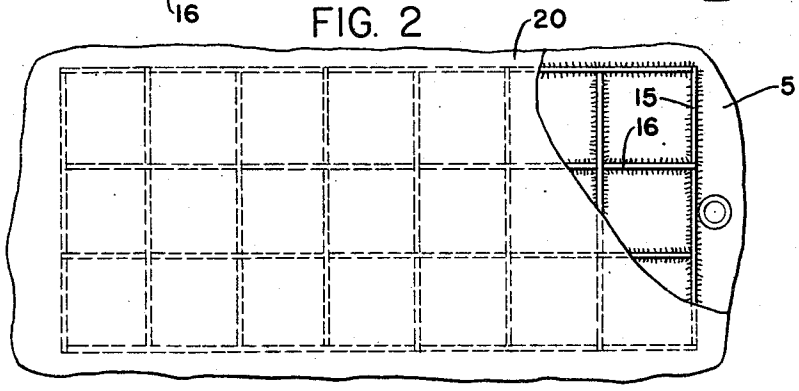


FIG. 3

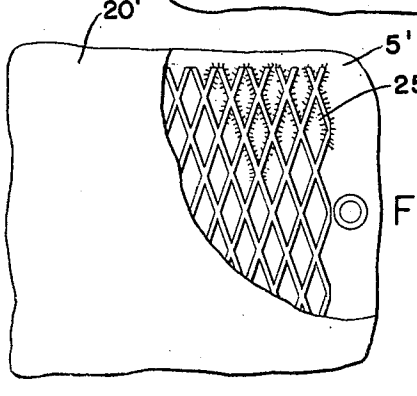


FIG. 5

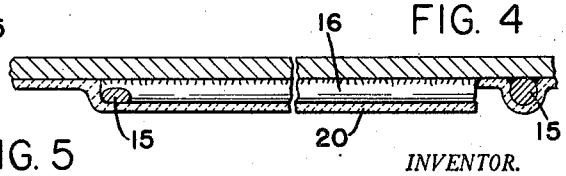


FIG. 4

INVENTOR.
CLARENCE J. RODMAN
BY Gordon C. Clark
ATTORNEY

Jan. 21, 1958 C. J. RODMAN 2,820,228

BATHTUB WITH REINFORCING MEANS

Filed July 1, 1957 3 Sheets-Sheet 2

FIG. 6

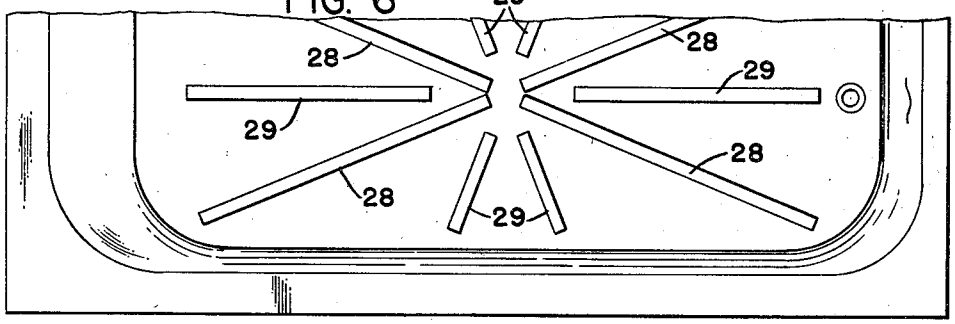


FIG. 7

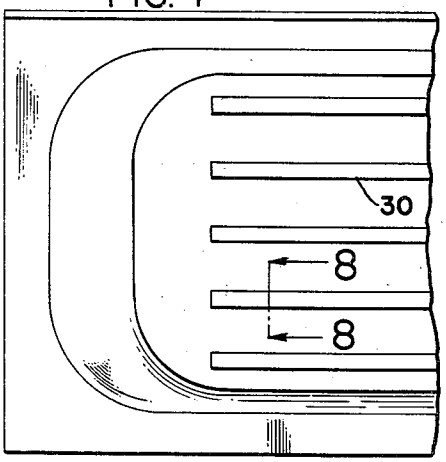
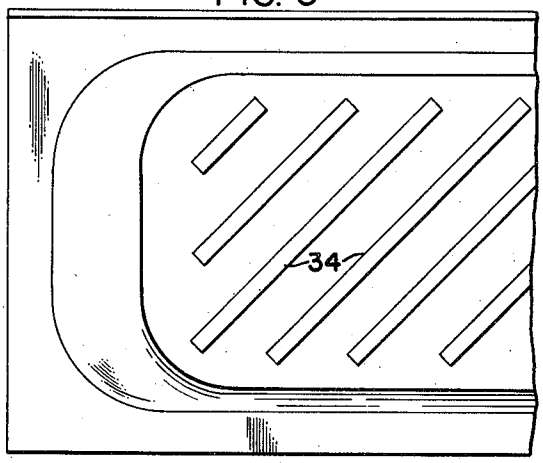


FIG. 9



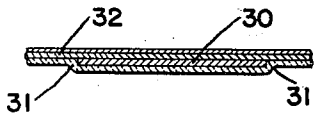
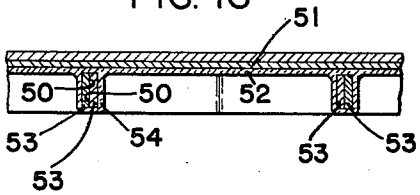


FIG. 8

FIG. 16



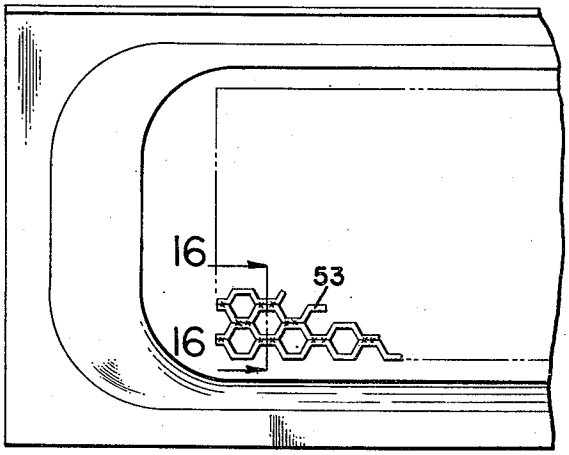


FIG. 15

INVENTOR.

CLARENCE J. RODMAN

Jan. 21, 1958 C. J. RODMAN 2,820,228

BATHTUB WITH REINFORCING MEANS

Filed July 1, 1957 3 Sheets-Sheet 3

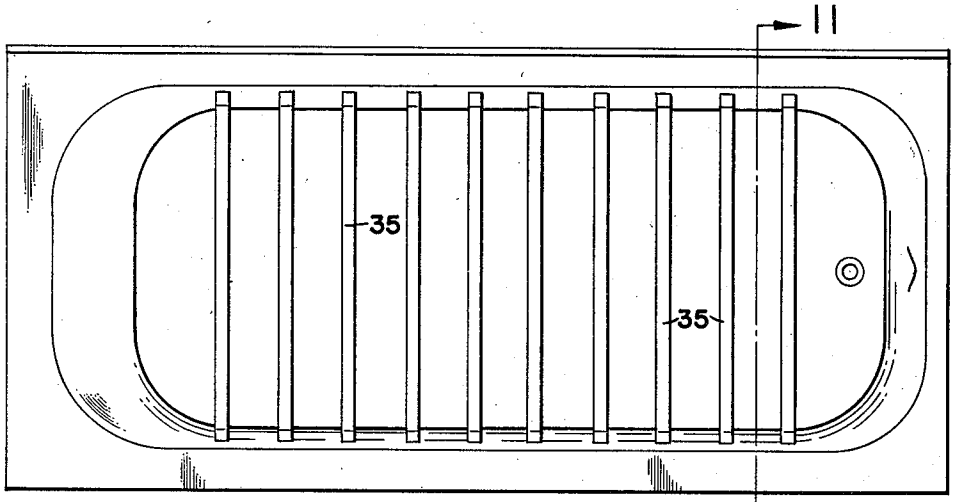


FIG. 10

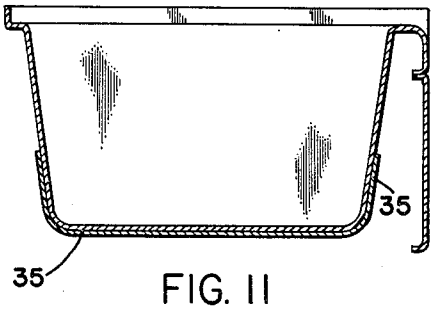


FIG. 11

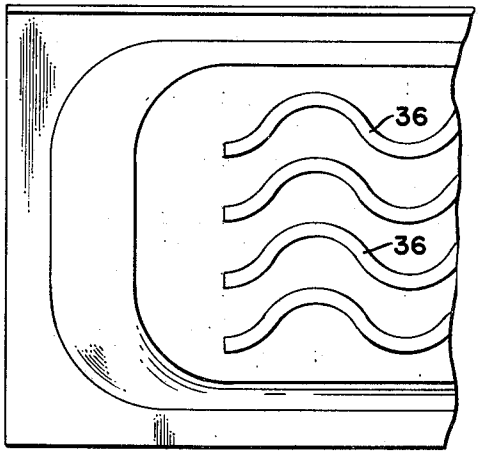
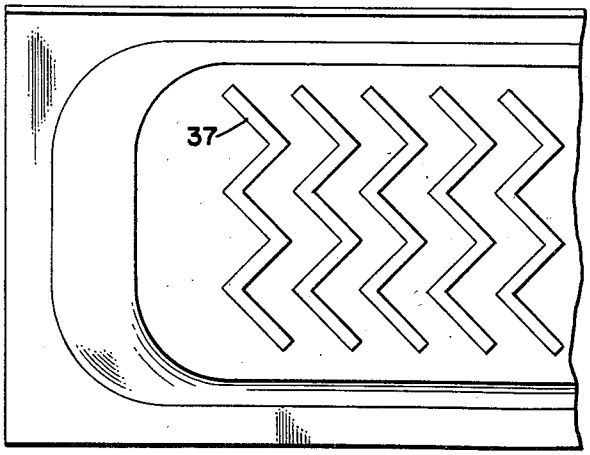


FIG. 12

FIG. 13



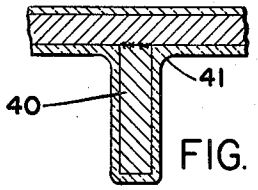


FIG. 14

INVENTOR.

CLARENCE J. RODMAN

United States Patent Office

2,820,228

Patented Jan. 21, 1958

2,820,228

BATHTUB WITH REINFORCING MEANS

Clarence J. Rodman, Alliance, Ohio

Application July 1, 1957, Serial No. 669,374

14 Claims. (Cl. 4—173)

This invention relates to the construction of that type of bathtub which is supported from the rim so that the bottom or bell of the tub hangs freely. In the industry this is known as a free-hanging tub. The tub is drawn from a sheet of steel, and preferably is coated with porcelain enamel. It is drawn from such light-weight steel that unless reinforced, it would become distorted in normal usage by the weight of water and an occupant carried by it.

According to this invention the outside or underneath surface of the bell of the tub is strengthened by an open lamina which reinforces substantially the whole of the bottom of the bell. It is described as "open" because it does not cover the whole of the reinforced area of the tub, but covers only certain areas, leaving other areas uncovered. This reinforcement, or part of it, may extend up the side of the tub, and dampen its vibrations, so that it does not so readily reflect noises. Alternatively, the side of the tub may be dampened in this way without reinforcing its bottom.

The reinforcement is usually united to the bottom of the tub by welding, but any means of uniting the reinforcement to the tub may be employed. In the preferred construction the entire tub, both inside and outside, is sprayed with porcelain enamel and baked, and on the reinforced bottom there is a continuous integral layer of the enamel which adheres to the exposed surfaces of the bottom and the reinforcement, and forms fillets around the edges of the reinforcement. This enamel coating aids materially in reinforcing the tub.

The tub is drawn from light-gauge steel sheet, such as 20 to 16 gauge (U. S.). The open spaces in the reinforcement minimize its weight and thus minimize the ultimate weight of the tub. This not only reduces the amount of metal consumed, but because of the reduction in weight reduces the freight charges and the cost of crating, etc. for shipment.

The nature of the reinforcement is referred to herein as a laminate reinforcement. The action of this type of reinforcement is explained in this way. If two metal plates of uniform thickness are placed one on top of the other without being fastened together, and these are then placed on two spaced supports and a weight is applied between the supports, the two plates bend approximately half as much as either one alone would bend under the same conditions. However, if the two plates are firmly secured to each other so that one cannot slip over the other, the amount the two are bent by the application of a weight varies inversely as the cube of the thickness of the two plates and the deflection at the midpoint is only one-eighth that of a single sheet. Similarly, with the reinforcing lamina welded to the bottom of the tub so that there is no slippage between it and the tub, the effect of the reinforcement is much greater than would be expected from the amount the tub alone bends when a weight is applied. The enameled, laminated bottom is far stronger than could be anticipated.

The reinforcement lies flat against the bottom of the tub and the two are united together throughout substantially the whole of their contacting areas. Thus, if a reticulated wire reinforcement is used, the intersections of the two wires are preferably compressed so that when the reinforcement is applied to the bottom of the tub, substantially its whole surface area contacts the surface of the tub. Various types of reinforcement may be used, as, for example, a plurality of separate reinforcing elements, a grid structure, a perforated metal sheet, a sheet of expanded metal, etc.

If the laminae are discrete elongated elements, they will be narrow and usually will be perfectly flat. They can be zigzag strips or serpentine strips. They can be of a herringbone structure. They can be looped, one inside of another. Straight or zigzag, etc. strips are preferably staggered, so that no straight line extending from any edge of the bottom of the tub to the opposite edge can be located between them.

Separate elements may be laid flat against the bottom of the tub, or they may be fastened perpendicularly to the bottom of the tub. Any such perpendicular reinforcement, whether composed of separate elements or a single element, such as a grid, will ordinarily not stand more than a quarter or three eighths of an inch high.

Any type of grid reinforcement may be used. It may have a structure resembling a honeycomb formed either by casting or by assembling separate sinuous strips shaped as a continuous S curve or a continuous block S. It may be formed of an expanded metal sheet, with the short, thin expanses of the metal turned thru an angle of 90 degrees so that they stand perpendicularly on the bottom of the tub.

A rigid reinforcement which covers a large area of the bottom of the tub is preferably not welded to the bottom of the tub because it is desirable for the reinforcement to yield with the bottom of the tub which expands when a weight is placed in the tub and contracts when the weight is removed. Instead of welding, the reinforcement may be embedded in the enamel, as more fully explained below.

The invention is further explained in connection with the accompanying drawings, in which—

Fig. 1 is a plan view of a tub partly broken away to show the reinforcement welded to its bottom;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a bottom view of a porcelain-coated tub with part of the porcelain broken away to show the reniforcement;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a bottom view of a modification corresponding to the view shown in Fig. 3, with part of the porcelain broken away to show the reinforcement;

Fig. 6 is a bottom view of a porcelain-coated tub with longitudinal reinforcement;

Fig. 8 is an enlarged detail on the line 8—8 of Fig. 7;

Fig. 9 is a bottom view of one end of a tub with diagonal reinforcement;

Fig. 10 is a bottom view of a tub with lateral reinforcement;

Fig. 11 is a cross-section thru the tub of Fig. 10 on the line 11—11;

Fig. 12 is a bottom view of a tube with serpentine reinforcement;

Fig. 13 is a bottom view of a tub with zigzag reinforcement;

Fig. 14 is a section thru a reinforcement attached perpendicularly to the bottom of a tub;

Fig. 15 is a bottom view of a portion of a bottom of a tub with a grid reinforcement; and

Fig. 16 is a section on the line 16—16 of Fig. 15.

The tub of the invention is drawn from light-weight

steel sheeting, for instance 18-gauge material which is 0.050 inch thick. The bell 5 is formed by a single draw or by multiple draws. The tub is of the free-hanging type. The edge of the tub on three sides is drawn into a vertical flange 7 which serves as a splash guard. This flange or guard rises substantially perpendicularly from a relatively horizontal portion 8 of the rim. This portion of the rim is adapted to be suported by stringers or the like fastened to three walls which form a niche into which the tub fits. The splash guards 7 fit flush against the walls of the room. The front edge 10 of the tub is turned under and rests on an apron which extends to the floor. Thus the bottom of the bell 12 is supported above the floor and the reinforcement under the bottom of the bell is above the floor level and out of contact with it.

The reinforcement shown in Figs. 1–4 is formed of a series of shorter wires or rods 15 and longer wires or rods 16 which are interwoven and subjected to sufficient pressure at the intersections so that the top surfaces of the wires or rods 16 throughout their entire length, including the areas closely adjacent the intersecting wires or rods 15, lie flat against the underside of the bottom 12 of the tub, and the same is true of the cross wires or rods 15. These wires have high tensile strength, relatively low elongation, and may be up to 3/16 inch in diameter. The drawings illustrate a maximum spacing of about six inches between adjacent wires of this flattened reticulated structure. The spacing will depend upon the strength of the individual wires and may be no more than an inch or two, but may be as much as 5 or 6 inches or more.

Although the reinforcement may be spot welded to the bottom of the tub, at the intersections of the wires or intermediate these intersections, preferably the whole of the top of the reinforcement is welded to the bottom of the tub. To do this, the tub may rest on the reinforcement which, in turn, is suported on one electrode of welding equipment, while the electrode, preferably as long as the individual wires, is pressed down on the tops of the wires, one at a time, or simultaneously, so that the entire length of the respective wires is welded to the bottom of the tub. Such welding does not interfere with subsequent porcelainizing. After the welding has been completed the tub is sprayed with a suitable ground coat, such as a cobalt ground coat, and then with a porcelain enamel, such as a titania (titanium dioxide) enamel. The tub is preferably sprayed both inside and outside, and then baked.

The thickness of the porcelain enamel is such that it is not shown in either Fig. 1 or Fig. 2. In the other figures a single coating is shown to represent both the ground coat and the enamel. Figure 3 clearly shows how the enamel 20 covers the wire and fills in the corners at the bottom of the tub and the wires.

Figure 5 shows an alternative type of reinforcement, namely, expanded metal 25. The entire length of each span of metal is preferably welded to the bottom of the tub, although here, again, the reinforcement may be spot welded. In any spot welding the welds are spaced sufficiently close so that there is no opportunity for any movement between the reinforcement and the bottom of the tub as the tub is loaded or unloaded. Figure 5 shows the bottom of the tub 5' coated with porcelain enamel 20 which covers the exposed surface of the reinforcement and covers the entire surface of the bottom of the tub in all of the openings of the reinforcement.

Figure 6 illustrates a different type of reinforcement built up of discrete elements. These elements extend radially from the central portion of the bottom of the tub. The longer elements 28 extend outward from the center, whereas the shorter elements 29 do not reach the center. The entire bottom of the tub is covered with a continuous coating of the titanium porcelain enamel as is the interior of the tub.

In Fig. 7 the bottom of the tub is covered with parallel reinforcing strips 30. These strips may be of steel of stubstantially the same thickness as the bottom of the tub. Thus with a tub having a bottom of 20 to 16 gauge steel, the reinforcing laminae may be of 20 to 16 gauge steel of the same or a different composition. Ordinarily the reinforcing laminae will be no thicker than the bottom of the bell of the tub.

The enlarged detail (Fig. 8) shows how the porcelain enamel forms fillets 31 on the bottom of the tub 32 at the edges of the reinforcements.

In Fig. 9 the same type of reinforcements 34 are used, but are arranged diagonally across the bottom of the tub.

In Fig. 10 the reinforcements 35 extend laterally acrosss the tub. They are the same type discussed in Figs. 6 to 9. An advantage in arranging the reinforcements across the tub is that they may be brought upwardly beyond the bottom as most clearly illustrated in Fig. 11 where they dampen the vibration of the sides of the tub, so that the sides do not act as sounding boards for noises originating within and outside of the tub. This tub is coated both inside and outside with porcelain enamel.

Figures 12 and 13 illustrate further modifications of the invention. In Fig. 12 the reinforcements 36 are serpentine, and in Fig. 13 the reinforcements 37 are zig-zag. These reinforcements are cut from flat sheets of steel or other metal which may be the same gauge as the tub material. These tubs are porcelainized both inside and outside.

The reinforcements may be about an inch wide, more or less, and are preferably not more than about 6 or 8 inches apart, and may be closer. Narrower reinforcements will be used where the reinforcements are placed close together, and wider reinforcements will be used where the reinforcements are farther apart. The width required for the reinforcements will depend upon the gauge of the tub and the gauge of the reinforcements as well as the distance between them. Ordinarily they will be of the same gauge steel as the tub, but they may be of a different thickness and may be of a different composition from the tub.

It is not necessary that the reinforcement lie flat against the bottom of the tub as in a laminate reinforcement. Thus separate reinforcing elements, which are perhaps 1/8 inch thick and 1/4 to 3/8" wide may be laminated perpendicularly to the bottom of the tub. They may be placed lengthwise of the tub, or across the tub, or they may be arranged diagonally across the bottom. They need not be straight, but may be zigzag or serpentine. Fig. 14 is a cross section thru the bottom of a tub which is made of 20 to 16 gauge steel, with such a reinforcement 40 (shown on a magnified scale). The enamel coating forms fillets 41 in the corners between the bottom of the tub and the bottom of the reinforcement. These produce a very substantial reinforcement of the bottom of the tub.

Such a vertical reinforcement may be in the form of a grid, as illustrated in Figures 15 and 16. This grid may be structurally like a honeycomb. It may be cast. An assembled form is illustrated, in which flat strips are bent into continuous block S curves, and assembled with the surfaces 50 in abutting relation and welded together or otherwise united. The block S curves are preferably not made with right-angled bends, so that the grid is not absolutely rigid, but has some give.

As shown, this grid is not welded to the tub, but is embedded in the enamel. The reinforcement is preferably applied with the tub in the inverted position. The bottom of the tub is then first sprayed with a cobalt or other oxide coating 51, and baked. This baked coating is sprayed with the porcelain enamel 52, the grid 53 is put in place, the grid is then sprayed with the enamel 54, and then this is baked. This grid is not rigidly attached to the tub, but is more flexibly attached because of the intervening oxide and enamel coatings.

The drawings are illustrative. The invention relates to free-hanging tubs, regardless of the means by which they are supported. The reinforcement likewise is illustrative. Lattice work, foraminous sheets, etc., etc. may be employed. The reinforcement comprises open spaces so that the weight added by the reinforcement is minimized. Furthermore, the laminate reinforcement is thin, being no more than a small fraction of an inch thick, so that tubs of the free-hanging type may be reinforced without any appreciable increase in their over-all height. The reinforcement may be spot-welded to the tub, or the entire contacting area of the reinforcement may be welded to the tub, or the reinforcement may be united to the tub by any other means.

This application is a continuation-in-part of my application Serial No. 641,005 filed February 19, 1957 and now abandoned.

The invention is defined in the claims which follow.

What I claim is:

1. A free-hanging bathtub having the bell thereof drawn from a sheet of steel which is substantially 20 gauge to 16 gauge, the bottom of the bell having an open metal laminate reinforcement united to it, with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

2. A free-hanging bathtub having the bell thereof drawn from a sheet of steel which is substantially 20 gauge to 16 gauge, the bottom of the bell having an open metal laminate reinforcement lying flat against it, with substantially the whole of the contacting areas of the bottom of the tub and the top of the reinforcement welded to one another, and with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

3. A free-hanging bathtub having the bell thereof drawn from a sheet of steel from 20 gauge to 16 gauge with a flattened reticulated reinforcement welded to the underside of the bottom thereof, with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

4. A free-hanging bathtub having the bell thereof drawn from a sheet of steel from 20 gauge to 16 gauge with discrete laminate reinforcing elements for substantially the entire bottom area of the tub welded to the underside of the bottom, with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

5. A free-hanging bathtub having the bell thereof drawn from a sheet of steel from 20 gauge to 16 gauge with discrete reinforcing elements welded across the underside of the bottom of the tub and at least part of the way up the sides thereof so as to deaden the vibration of the sides, and with exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

6. A free-hanging bathtub having the bell thereof drawn from a sheet of steel, with reinforcing means welded to the sides of the tub so as to deaden the vibration of the sides said sides and reinforcing means being covered with an integral coating of porcelain enamel.

7. A free-hanging bathtub having the bell thereof drawn from a sheet of steel, with flat discrete laminate elements welded flat against the sides of the tub so as to deaden the vibration of the sides, and with an integral coating of porcelain enamel over the sides of the tub and said discrete elements.

8. A free-hanging bathtub having the bell thereof drawn from a sheet of steel, with flat straight reinforcing elements united perpendicularly to the bottom of the tub, and with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

9. A free-hanging bathtub having the bell thereof drawn from a sheet of steel, with a grid reinforcement fastened to the bottom of the tub, and with the exposed surfaces of the bottom of the tub and the reinforcement covered with a continuous coating of porcelain enamel.

10. A free-hanging bathtub substantially the whole of the bottom of which is reinforced by a reinforcement having open spaces therein exposing areas of the bottom of the tub, with said exposed areas of the bottom of the tub and exposed surfaces of the reinforcement covered with a continuous coating of porcelain enamel.

11. A free-hanging bathtub, with an oxide coating on the bottom thereof, a continuous porcelain enamel coating over the oxide coating and reinforcing means for the bottom of the tub embedded in the enamel coating.

12. A bath tub with a bell drawn from sheet metal, said bell being too thin to support the load it is intended to support, the exterior of the bell being porcelain-enameled, and spaced reinforcement means on the exterior of the bell effective to reinforce the entire bottom of the bell, said reinforcement means being embedded in the porcelain enamel whereby the bell is capable of supporting the load it is intended to support, the tub being adapted to be supported by its rim with the bottom of the reinforcement of its bell above the floor.

13. The bathtub of claim 12 in which reinforcing members on the bottom of the bell extend up the sides thereof and are embedded in the exterior coating of porcelain enamel and dampen any tendency of the sides of the bell to vibrate.

14. The tub of claim 12 in which the sheet metal is steel of substantially 20 to 16 gauge.

References Cited in the file of this patent

UNITED STATES PATENTS

993,826	Danver	May 30, 1911
2,079,739	Houseweller	May 11, 1937
2,122,245	Callahan	June 28, 1938
2,371,754	Gillum et al.	Mar. 30, 1945
2,449,323	Richterkessing	Sept. 14, 1948
2,534,147	Rodman	Dec. 12, 1950
2,697,231	Strand	Dec. 21, 1954

FOREIGN PATENTS

562,587	Great Britain	July 7, 1944
938,983	Germany	Feb. 9, 1956