

DRUM

This invention relates to drums, for example for containing products such as bitumen.

Drums normally have walls of sheet metal. Typically (see figure 1) a circular top wall 1 is joined by a crimped seam 2 around its periphery to a cylindrical side wall 3. The seam forms a raised rim around the top wall. A bottom wall 4 is joined to the side wall in the same way. The top wall contains a filling hole covered by a removable lid 5.

Drums are often stored outside, sat on their bases and with their top walls uppermost. When it rains, the region on the top wall that is enclosed by the rim collects water. This causes corrosion of the top wall, and damage to any artwork there, until the water has evaporated.

Drums having reinforcing rings in their top walls are well-known (see, for example, GB 1 212 519). However, no attempt has previously been made to reduce the amount of water that can stand on the drum's top wall by providing a prominently raised ring in the top wall which substantially reduces the available volume in the region enclosed by the lid.

According to the present invention there is provided a drum comprising: a bottom wall; a side wall; and a top wall joined at its periphery to the side wall leaving an upstanding rim around the periphery of the top wall, the top wall being configured to have a liquid-displacing reinforcing ring projecting upwards by at least half the height of the rim to displace liquid from the region enclosed by the rim.

The ring suitably occupies at least 20%, 30%, 40% or 50% of the volume in which liquid could otherwise collect in the region enclosed by the rim. The height of the ring is preferably more than half of the height of the rim, for instance around three-quarters of that height. The height of the rim is suitably determined from the base of the top wall to the top of the rim. If the rim is not of uniform height then the lowest

height of the rim is relevant, since that is where water will spill out of the volume enclosed by the rim.

The radial width of the ring is suitably at least 20% or 30% of the radius of the top wall. The ring is preferably defined by a pair of annular side walls bridged by an annular ring top wall. When the ring has this configuration the term "radial width" of the ring as used herein refers to the width of the annular ring top wall as measured from its inner edge to its outer edge in a radial direction. The side walls are preferably sloped, although they could be vertical. The ring top wall is preferably flat. Therefore, a preferred cross-sectional shape for the ring is a trapezium with the shorter parallel side upwards. Other possible cross-sectional shapes for the ring include part-circles, rectangles, a trapezium with the longer parallel side upwards and more complex shapes. The ring top wall preferably lies below the uppermost part of the rim. The ring is preferably formed by pressing the top wall into shape. It could alternatively be fixed on to the top wall.

Although the top wall could include two or more reinforcing rings it preferably comprises only a single reinforcing ring. If more rings are used then the volume occupied by the rings is reduced.

The rim preferably includes a joint between the top wall and the side wall. The joint is suitably a folded/crimped seam. The top wall is preferably joined to the side wall, most preferably to the upper edge of the side wall, around its periphery. Depending on the application to which the drum is to be put the seam may or may not be air-tight.

The drum is preferably of a generally circularly cylindrical shape. The top wall is preferably substantially circular in outline. The bottom wall is preferably substantially circular in outline. The side wall is preferably substantially circularly cylindrical. The ring is preferably annular and concentric with the outline of the top wall.

The top wall preferably includes an opening for providing access to the interior of the drum. The opening preferably lies radially inward of the ring. The opening is preferably circular and concentric with the ring.

The bottom wall is suitably joined at its periphery to the side wall leaving a downwardly projecting bottom rim around the periphery of the bottom wall. Like the joint between the top wall and the side wall, depending on the application to which the drum is to be put the joint between the bottom wall and the side wall may or may not be air-tight. However, the bottom wall of the drum is preferably of a different configuration from the top wall. For instance, the bottom wall preferably has no opening for providing access to the interior of the drum, the bottom wall preferably has more than one reinforcing ring, and the reinforcing ring(s) in the bottom wall are preferably narrower and/or of smaller height than the ring(s) of the top wall. Preferably the bottom wall is configured to have one, two or more reinforcing rings projecting downwards by half or less than half the height of the bottom rim. Most preferably it has no reinforcing ring that projects downwards by more than half the height of the bottom rim. Suitably each reinforcing ring of the bottom wall comprises a pair of inclined annular side walls joined together.

The volume of the drum is preferably greater than 50, 100 or 150 litres.

The present invention will now be described by way of example with reference to the accompanying drawings, in which:

figure 2 shows an assembled drum;

figure 3 shows an exploded view of the drum;

figure 4 shows the drum engaged by a lifting tool;

figure 5 shows a cut away side view of the drum;

figure 6 shows a partial side view of the drum before attachment to the top and bottom covers;

figure 7 shows a fragmentary view of the top cover before attachment to the side wall;

figure 8 shows a partial cross-section of the top cover before attachment to the side wall;

figure 9 shows a fragmentary view of the lid before attachment to the top cover;

figure 10 shows a partial cross-section of the lid before attachment to the side wall;

figure 11 shows a fragmentary view of the bottom cover, with its lower face uppermost, before attachment to the side wall;

figure 12 shows a partial cross-section of the bottom cover, with its lower face uppermost, before attachment to the side wall;

figure 13 shows cross-sections of the joint between the top cover and the side wall before and after seaming;

figure 14 shows cross sections of the joint between the top cover and the lid before and after seaming;

figure 15 shows a partial cross-section of the top cover, the side wall and the lid after seaming;

figure 16 shows a plan view of the drum engaged by an alternative lifting tool; and

figure 17 shows a side view of the drum engaged by the alternative lifting tool in a drum grabbing position and a drum pushing position. The drawings are not to scale. The dimensions on the drawings are in millimetres.

Figure 2 shows an assembled drum for bitumen and figure 3 shows an exploded view of the components of the same drum. The drum has a top cover 10, a bottom cover 11 and a side wall 12. The top cover includes an opening 13 which can be closed by a lid 14. In the assembled drum the top cover is seamed to the side wall, leaving an upstanding rim 41, and when fixed in place the top cover then provides the top wall of the drum. The top wall includes a broad, prominently raised ring 22. When the drum is stored outside the ring displaces rain water from the volume enclosed by the rim 41. Since less water collects in that volume the lid can dry more quickly by evaporation, reducing the damage to the lid from corrosion etc. and reducing the risk of water seeping into the drum through the lid seal.

The side wall 12 is generally circularly cylindrical, with annular corrugations running around it. Only the very upper and lowermost regions of the side wall are free from corrugations. As shown in figure 4, the corrugations extend throughout a lifting zone close to the top of the drum where the side walls of the drum may be engaged by the jaws 15,16 of a lifting tool. The lifting zone is close to the top of the drum so that when the drum is squeezed in the lifting zone by the jaws 15,16 the top wall of the drum (provided by the top cover when it is fixed in place) contributes substantially to

resisting inward deformation of the side wall in the lifting zone. If the drum is upside down it may be lifted at a corresponding bottom lifting zone close to the bottom of the drum.

The drum will now be described in more detail.

The drum is a 160 litre drum having a diameter of 500 mm and a height of 865 mm. The top cover 10, bottom cover 11 and side wall 12 are made from 0.600 mm steel sheet and the lid 14 is made from 0.500 mm steel sheet. Other materials, for instance aluminium, tin or plastics, or other gauges of sheet may be used.

The side wall 12 is shown in detail in figures 5 and 6. The side wall is curved so as to adopt a generally cylindrical shape. Around the cylinder run annular corrugations which are formed by pressing the sheet. The corrugations have a pitch of 36.0 mm and a depth of 2.5 mm. Each corrugation is formed by a pair of sloping walls joined by a fold. The radii of the folds in the sheet, which give shape to the corrugations, are small so that the corrugations are generally angular. There are twenty corrugations over the full height of the side wall. Each corrugation is adjacent to the next, leaving 54.5 mm lengths of flat wall 17,18 at the top and bottom of the side wall.

The corrugations protect the side walls against deformation from knocks or under stress from the contents of the drum. Such deformation could otherwise dent or even rupture the drum. This protection is increased by the fact that the drum has 20 corrugations - more than in prior drums. Most importantly, the entire height of the region engaged by the lifting tool is corrugated so as to provide particular protection against inward deformation by the tool. Only the two narrow regions mentioned above are free of corrugations; these are left free so as to facilitate the unhampered seaming of the top and bottom covers to the side wall during the manufacturing process.

The top cover is shown in detail in figures 7 and 8. The top cover has an outer flange 19 for seaming to the side wall as will be described below. Radially inwards of the outer flange is a vertical wall 20 which connects the flange to the base of the top

cover. The base is pressed so as to define a broad raised ring 22 which stands prominently up from the inner 23 and outer 24 parts of the base. Radially inwards of the base is a shoulder 25 from which rises a neck 26 of the opening 13. The neck has a upstanding wall which terminates in a radially outwardly directed inner flange 27. The raised ring is defined by a pair of inner 28 and outer 29 sloping walls which rise at an angle from the parts 23,24 and a flat annular wall 30 which bridges between the sloping walls. The base lies 13.5 mm below the top of the vertical wall 20. The inner radius of the ring is 300 mm and the outer radius is 440 mm.

The lid is shown in detail in figures 9 and 10. The major surface 31 of the lid is flat. Around the periphery of the lid is a U-shaped channel 32 which opens downwards and is defined by two vertically-directed walls 33,34. A third vertically directed wall 35 raises the major surface of the lid to nearly the level of the top of the channel 32, so that little water can collect on the major surface 31 to obscure or damage artwork on the major surface but the surface 31 can still be protected against damage by the slightly proud rim of the lid. A narrow groove is left between the walls 34 and 35. As will be described below, when the lid is fitted in place to close the opening 13 the channel 32 is fitted over the neck 26 of the top cover. There are four shallow indentations 36 around the periphery of the major surface 31. When several lids are stacked together in magazine-fashion during the production process these indentations prevent the lids from jamming together.

The bottom cover is shown in detail in figures 11 and 12. The bottom cover has an outer flange 47 and a vertical wall 37 similar to those of the top cover. Two annular strengthening ridges 38,39 are pressed downwards from the bottom cover. The depth of the ridges is 5 mm. The relatively low profile of these ridges is to increase the clearance of the peaks of the ridges from the ground (when the finished drum is laid on the ground) or from other drums (when they are stacked) so as to avoid damage to the ridges. Having two ridges rather than one increases the stiffness of the bottom cover.

Figures 13 to 15 illustrate the seaming together of the components of the drum. As shown in figure 13, to join the top cover to the side wall the outer flange 19 is placed over a corresponding flange 40 which projects outwards from the top of the side wall.

This operation is made much easier by the presence of the broad ring 22 in the top cover. Without the ring the top cover tends to warp because of stresses inherent in its method of manufacture. However, the broad ring makes the top cover more rigid and level. This enables the outer flange 19 to be aligned more accurately against the flange 40, allowing a stronger seam joint to be made. After the flanges are aligned, the outer flange 19 is then folded down and around the flange 40 and the two are pressed against the outer surface of the side wall. This results in a reinforced rim 41 which stands up by 15 mm from the top wall of the finished drum. (See also figure 2). The bottom cover is attached in a similar way to provide the drum with a bottom wall.

As shown in figure 14, to fix the lid in place the channel 32 is located over the inner flange 26 and the outer wall 33 of the channel is crimped against the inner flange 26. When the assembly is completed the major surface 31 of the lid lies a little below the upper extremity 42 of the rim 41 (see figure 15). This allows the rim to protect the lid and any artwork on it from damage.

To assemble the drum the components are stamped to size and pressed to shape. The top and bottom covers are seamed to the side wall. Then the outside of the drum is painted with a coat of black enamel paint. The flat top surface 31 of the lid is painted and silk-screened with, for example, a company logo and details of the product. The inside surfaces are not treated or painted. Then the drum is filled with liquid bitumen at around 130 to 180°C and the lid is seamed in place. As the bitumen cools it shrinks and becomes semi-solid. To avoid a vacuum in the container as the bitumen shrinks (which could cause deformation of the drum) the seams of the drum are not made fully air-tight. When filled with bitumen the drum will weigh approximately 160kg. The finished drums may be stacked 10-high, even when filled.

When a filled drum is stored outside, with its top surface uppermost, rain may collect in the volume enclosed by the upstanding rim around the periphery of the top wall. However, the large ring 22 displaces water from the volume. Depending on the dimensions of the ring, from 20% to 50% (or more) of the water that would otherwise collect is displaced by the ring. Since less water collects, the lid dries by evaporation

more quickly and damage to the lid from corrosion etc. is reduced. To promote this effect it is preferred that the dimensions of the ring are significantly larger than mere reinforcing ring formations which are known in prior drums. For example, the height of the liquid-displacing ring should preferably be greater than half the height of the upstanding rim (and if the rim is uneven, preferably than the height of the lowest part of the rim). The width of the ring, measured in a radial direction from the inner edge of the wall 30 to the outer edge of the wall 30, is preferably at least 20% of the radius of the upper wall.

Figures 16 and 17 show an alternative drum lifting tool, which is an attachment for a fork lift truck or the like. The tool of figures 16 and 17 has a frame 43 which bears near its top a grabbing head 44 and at its base a foot 45 curved to match the side wall of a drum. The tool can be raised and lowered by the fork lift truck between a drum pushing position (as shown at the right of figure 17), a drum grabbing position (as shown at the left of figure 17) and a drum lifting position which is higher than the drum grabbing position. With the tool in the drum pushing position the fork lift truck can push the drum with the foot 45 against the lifting zone of the drum. With the tool in the drum grabbing position a beak 46 in the head 44 can grab the upper rim 41 of the drum. When the rim of the drum has been grabbed by the beak the fork lift truck can lift the drum by raising the tool to the lifting position.

The present invention may include any feature or combination of features disclosed herein either implicitly or explicitly or any generalisation thereof irrespective of whether it relates to the presently claimed invention. In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. For example, the drum could be a container of any suitable shape (e.g. of square or polygonal cross-section) and size. Instead of folded or crimped seams welding could be used.

CLAIMS

1. A drum comprising: a bottom wall; a side wall; and a top wall joined at its periphery to the side wall leaving an upstanding rim around the periphery of the top wall, the top wall being configured to have a liquid-displacing reinforcing ring projecting upwards by at least half the height of the rim to displace liquid from the region enclosed by the rim.
2. A drum as claimed in claim 1, wherein the ring occupies at least 20% of the volume in which liquid could otherwise collect in the region enclosed by the rim.
3. A drum as claimed in claim 1 or 2, wherein the radial width of the ring is at least 20% of the radius of the top wall.
4. A drum as claimed in any preceding claim, wherein the top wall is crimped to the side wall around its periphery.
5. A drum as claimed in any preceding claim, wherein the top wall and the bottom wall are substantially circular and the side wall is substantially circularly cylindrical.
6. A drum as claimed in any preceding claim, wherein the ring comprises a pair of annular side walls bridged by a ring top wall.
7. A drum as claimed in claim 6, wherein the ring top wall is flat.
8. A drum as claimed in any preceding claim, wherein the top wall has only a single reinforcing ring.
9. A drum as claimed in any preceding claim, wherein the top wall includes an opening for providing access to the interior of the drum.
10. A drum as claimed in any preceding claim, wherein the bottom wall is joined at its periphery to the side wall leaving a downwardly projecting bottom rim around the periphery of the bottom wall.



11. A drum as claimed in claim 10, wherein the bottom wall is configured to have two or more reinforcing rings projecting downwards by half or less than half the height of the bottom rim.
12. A drum as claimed in claim 11, wherein each reinforcing ring of the bottom wall comprises a pair of inclined annular side walls joined together.
13. A drum as claimed in claim 11 or 12, wherein the bottom wall has no reinforcing ring that projects downwards by more than half the height of the bottom rim.
14. A drum substantially as herein described with reference to figures 2 to 17 of the accompanying drawings.

