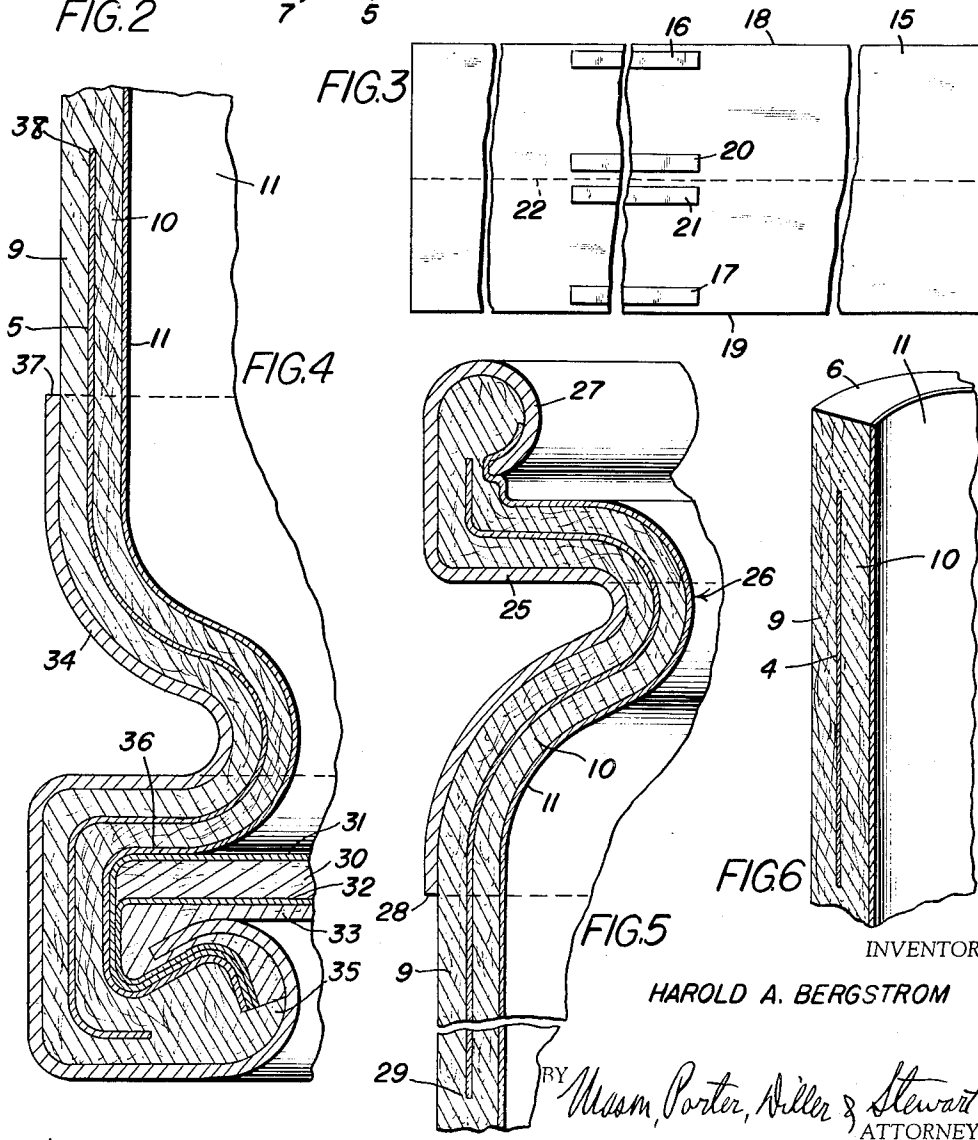
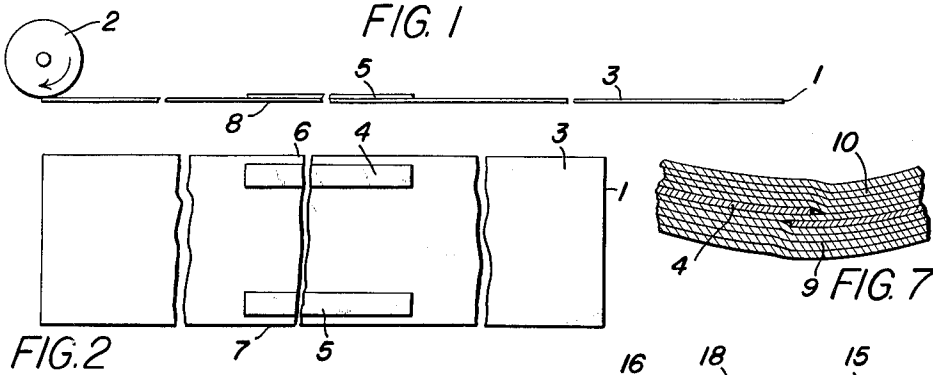


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REINFORCED DRUM BODY

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REINFORCED DRUM BODY

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This invention relates to new and useful improvements in heavy duty fibre drums of a large capacity and especially adapted for storing and shipping liquid or semi-liquid products, and more particularly involving an improvement over my Letters Patent 2,775,384 issued December 25, 1956.

Although the drum disclosed in the abovementioned patent is satisfactory for the purpose intended, it has been found through various tests that utilization of an inner metal ply extending the entire length of the body wall in the manner disclosed in the abovementioned patent, and the producing of the body wall by the method disclosed therein can be improved upon through the utilization of the structure and method to be described in detail herein.

The fibre tube from which a drum of the character stated is formed, even in the absence of a reinforced ply therein, has been found through tests to have considerable compression strength. Formation of the chimes to include an annular groove adjacent the upper and lower ends of the tube will considerably decrease the compression strength of the tube, possibly as much as sixty percent. The filled drums are generally stacked three, four and sometimes five high so that the bottom drum must support a considerable weight. Additionally, a drum exposed to relatively high humidity conditions results in the fibre board from which the body wall is constructed becoming somewhat weakened and reducing the stacking strength to a considerable degree. It has been found that the reinforcing of the chime area of a drum by means of a circumferential partial ply of relatively thin sheet metal at the chime area appreciably increases the stacking strength of the drum and maintains the stacking strength since the sheet metal will not be affected during a high relative humidity condition.

It has been further found during actual vibration and shipping tests that in a filled drum, in the absence of a reinforcement ply at the bottom chime, considerable rigidity of the drum is lost due to the formation of the chime since the paper fibres are distorted in the body wall. During the tests conducted, considerable movement was observed immediately above the bottom chime even though the liquid tight seal at the bottom chime was not affected. Thus by utilization of a ply of relatively thin metal in the body walls and forming the same to the contour of the chime, the rigidity at this critical area was substantially increased.

In the shipping and handling of fibre drums, it has been observed, the most vulnerable areas susceptible to being punctured are immediately above and below the respective bottom and top metal chimes. In carload shipment, lumping and vibration of the cars will tend to cause the drums to tip over, this being especially true in refrigerator cars where the bottom of the car generally includes wood slats between which the bottom chime of the drum, as it tips, may become engaged, and during lumping, the top portion of the drum tends to tip forward. When this tipping occurs it may be severe enough so that the top or bottom chimes of adjacent drums are disposed upon one another and upon the next impact the drums will not be resting adjacent to one another so that the metal chimes will absorb the force of the impact. When such a situation occurs, the force of the impact will be absorbed by the fibre of the body wall above or

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below a respective bottom or top metal chime. However, if the body wall of the drums is reinforced by utilizing a partial metal ply of the character involved, puncture resistance of the drum will be improved at the previously mentioned vulnerable areas.

When filled drums are being handled for the purpose of unloading a truck or freight car and are dropped off of the loading dock, for example, the vulnerable points of damage in the sidewall have been found through tests to be immediately above the bottom or below the top metal reinforced chimes. When the drum is dropped, it is distorted, and, starting at the point of impact, it tends to assume an elliptical shape so that at approximately fifteen to thirty degrees from the point of impact, the fibre sidewall is placed under tension. The hydraulic pressure developed by the liquid in the drum tends to thrust outwardly, causing the sidewall to rupture at these points, resulting in vertical tears that will generally extend from one to two inches from the chime. By embedding a partial ply of a relatively thin sheet metal at these critical areas, the tensile force resulting during an impact of the character involved is absorbed or transmitted to the reinforcing ply and therefore tears or ruptures in the wall at the chime area are obviated.

When forming a tubular reinforced drum body in the manner disclosed in my Letters Patent 2,775,384 a leading and trailing sheet of stock material is taped to an intermediate sheet of metal and ultimately wound on a winding mandrel. The tube ultimately formed in this manner, although satisfactory for the purpose intended, requires a considerable amount of labor to be expended in preparing the material to be wound, and special attention must be given to the manner in which the leading and trailing sheets are secured to the intermediate reinforcing sheet of metal.

An object of this invention is to provide in a heavy duty fibre drum of the character stated a reinforced body wall, the body wall comprising a convoluted continuous sheet of stock material incorporating a pair of strips of light gage metal secured adjacent to and preferably, but not necessarily, inwardly of the edges of the stock material and forming circumferential partial reinforcing plies, the metal partial plies reinforcing the bottom and top chime areas of the drum.

A more specific object of the invention is to provide in a heavy duty fiber drum a convolutely wound body wall including a continuous sheet of stock material forming one or more inner and outer plies of the body wall, and a pair of strips of light gage metal one thereof at each end of the body wall and together forming a circumferential partial ply of the body wall intermediately of said inner and outer plies, said strips forming said partial ply of metal being fixed on one side of the continuous sheet of stock material and integrally formed into the body wall as the body wall is convolutely wound.

A further object of the invention is to provide a drum structure of the character stated including a bottom heading fitting into said body wall and secured thereto by forming said body wall into a holding bead, one of said strips of metal including a portion extending inwardly toward said holding bead and having a lower edge terminating within said stock short of the peripheral surface of said holding bead, said bottom heading comprising a tray including a flange extending into said holding bead, and a circumferential chime member including one edge extending into said bead, the other edge of said chime member terminating along the body wall at a point below the upper edge of said one strip of metal.

A still further object of the invention is to provide a drum structure of the character stated including an annular inwardly directed mounting bead formed about the upper edge of the drum and in the adjacent upper strip of sheet

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metal, a chime member circumposed about said bead and including a lower edge terminating above the lower edge of said upper strip of sheet metal, said upper strip of sheet metal having an upper edge terminating within said stock material short of the peripheral surface of said bead.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawing.

In the drawing:

FIGURE 1 is a view showing diagrammatically the method of forming from a stock blank a tubular cylinder incorporating partial metal plies adjacent the blank ends thereof with intermediate portions of the material being broken away;

FIGURE 2 is a top plan view of the blank stock material prior to the same being wound to form the tubular body of a drum;

FIGURE 3 is a plan view similar to FIGURE 2, showing the manner in which the blank stock material may be prepared for the purpose of forming a pair of tubular body members simultaneously;

FIGURE 4 is a fragmentary enlarged vertical section through the bottom portion of a drum showing the sheet metal partial ply embedded therein adjacent the chime of the drum and the body wall and bottom heading joined by a liquid tight beading;

FIGURE 5 is a fragmentary enlarged section through the upper portion of the body wall of the drum showing the sheet metal partial ply imbedded therein adjacent the chime of the drum;

FIGURE 6 is a vertical section through a formed cylinder having a partial metal ply embedded therein, which cylinder is to form the body wall of the improved reinforced fibre drum; and

FIGURE 7 is a fragmentary horizontal section through the completed wall of a portion of the improved drum at the position of one of the metal reinforcing inserts and showing how the ends of the insert may be overlapped.

Referring to the drawing in detail, indicated at 1, is a continuous strip of stock material, fibreboard or the like, which will be wound on a suitable winding mandrel 2 to form a convoluted tube used as the body of a reinforced heavy duty fibre drum. Secured on the upper surface 3 of the strip or sheet of stock material 1 are a pair of relatively light gage strips of sheet metal 4 and 5 parallel to each other and the respective adjacent side edges 6 and 7 of the stock material and preferably but not necessarily inwardly of said side edges. The strips of sheet metal are secured by means of a suitable adhesive material as indicated at 8 which may be initially coated on the strips of sheet metal and may be of the pressure-sensitive type, if preferred. When the stock material 1, after the strips of sheet metal have been secured thereon, has been rolled on the mandrel 2, a convoluted tube will be formed incorporating a series of outer plies 9, inner plies 10 and the partial metal ply as seen at 4 in FIGURES 6 and 7 and provided by the endwise spaced metal strip inserts. A suitable impervious liner 11 may be incorporated in the tube.

Details of the arrangement of the inner and outer plies in relation to the before mentioned partial ply insert 4 may be readily observed in FIGURE 7, it being noted that the incorporation of the metal ply formed from the metal strips 4 and 5 will not disturb the continuity of the stock material 1 thus retaining the normal fibre strength of such material.

Referring to FIGURE 3, the strip of stock material as indicated at 15 will be of sufficient width to form a pair of tubular elements to be used in constructing a pair of fibre drums. Parallel strips of light gage sheet metal as indicated at 16 and 17 will be secured on the stock material 15 adjacent the respective side edges 18 and 19. A second pair of strips of sheet metal 20 and 21 will be se-

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cured in spaced parallel relationship adjacent to and spaced from the longitudinal center 22 of the stock material. After the stock material 15 has been wound on a suitable mandrel to provide a convoluted tube, the tube will be split between the sheet metal strips 20 and 21 thus providing a pair of tubular body wall elements used in forming a pair of reinforced fibre drums.

While the spacing of the metal strips from the side edges has been stressed herein, it is to be understood that it is not absolutely essential that said strips be located inwardly from the side edges as shown in FIGURES 2 and 3. The reason for the preference that the metal strips be spaced inwardly as stated is so that when the wound tube is slit to proper height, the slitter knives will not have to cut through the metal. Another reason why it is preferred not to have the metal inserts go to the ends of the tube is because in its reinforcing function, it would do no good at the extreme ends and projection thereof to the end extremities would merely result in wastage of metal.

It is to be understood that when either a single drum is formed as in FIGURE 2, or two or more drums are to be formed as in FIGURE 3, the practice is always to slit the tube to the exact required height prior to continuing the remainder of the assembly and formation. It is impractical to convolutely wind a tube so accurately that the end edges thereof will be perfectly square, since any variations in caliper of paperboard will cause the paperboard to weave back and forth. In order to get square edges and a tube of accurate length, it is therefore the practice to perform a slitting operation in which the slitter knives are located exactly to the dimensions of tube height required. The slitter knives will then cut a sharp square edge such as is shown at 6 in FIGURE 6. At the outer edges of the tube, an allowance is usually made for about one-quarter to three-eighths inch trim loss. Obviously in FIGURE 3 where the slitting is to be included along the dotted center line 22, only a single slitter knife will be necessary in the center and then one knife at each outer edge will trim the tubes to proper length.

In FIGURE 7 the metal reinforcing strip is shown as of a length for very slightly overlapping at its ends. This arrangement may pertain, or there may be no overlapping of the metal strip ends. Actually, effort is made to have an exact length of metal strip so that there is no overlap, or even to run about one thirty-second of an inch less than a full meeting at the end edges of the strip. This is done primarily to ease the load on the forming dies because obviously there would be an extra strain placed on the dies at a point of overlapping.

Thus by means of a simple and expeditious method one or more tubular body elements may be formed to be used in a reinforced fibre drum for attaining the desirable advantages particularly as set forth in the objects of invention and for reducing the potential damage which might occur at the chime areas in the finished drums.

The tubes formed by the method mentioned above are used in making up the improved heavy duty reinforced fibre drums. The usual chime ring or collar 25, see FIGURE 5, is applied to the upper end of the tube, after which the body wall is beaded inwardly as indicated at 26 and the chime member is formed over the upper edge of the body wall as indicated at 27, as by rolling or crimping. It will be noted that the lower edge 28 of the chime member terminates above the lower edge 29 of the reinforcing metal ply 4 to afford the desirable protection in this critical area, especially during stacking, transit and unloading of the drums when they are filled with liquid.

As shown in FIGURE 4, the bottom heading of the drum may be constructed to include a filler disk 30, a liner 31, a metal tray 32 and also the fiberboard disc 33 which extends across the bottom of the drum in the manner illustrated. Optionally, the metal tray 32 may

be omitted. The protective liner 11 and liner 31 may be coated with a liquid resisting material such as polyethylene or any other type of suitable coating which will resist the penetrating or corrosive effect of materials which may be packaged, and will be strong and flexible enough to withstand the final forming of the body as well as various shipping abuses. A metal chime member 34 is placed on the body portion after which the chime, body wall and the flanges of the body heading are all formed into a very tight bead 35 which is formed against the bottom heading and clamps the same tightly against the shoulder 36 formed by inwardly beading the chime member 34 and the body wall in the manner previously described with respect to the upper bead 26. It is to be understood that when the pre-formed metal tray 32 is omitted, the various components 30, 31 and 33 are glued and registered into correct relationship with one another and this heading is then positioned into the cylindrical tube or drum body prior to mounting the metal band 34 and going through the final forming operations; therefore the tube actually serves as a fixture for pre-forming the bottom heading into the tube prior to the final operations.

It will be noted that the metal ply 5 embedded in the body wall extends upwardly above the upper edge 37 of the chime member 34, terminating thereabove as indicated at 38 and providing adequate protection for this critical area of the drum.

Thus there has been disclosed a readily manufactured reinforced fibre drum especially adapted for storing liquids or semi-liquids, particularly strengthening the drums at extremely critical areas, the drums incorporating tubular body members produced in an expeditious manner by a novel method.

In addition to the saving of the metal as against winding a thin ply of steel the full length of the tube as shown in Patent 2,775,384, this new method not only locates the steel at the most vulnerable point of the drum, but also permits fabricating from relatively narrow widths of steel. Light gage steel cannot be procured in too wide a width, approximately 36" being the widest available. Even a large drum run one up, as in FIGURE 2, present a problem if the drums are taller than steel is available. Obviously, it would be impossible to run large drums two up since it is possible to wind the paperboard up to seventy-five and one-half inches wide and light gage steel probably never will be available that wide. In the method shown in FIGURE 3, it would be possible to use one wider strip of metal in place of the two strips 20 and 21 since we would still be talking of a sheet only 12" or so wide. The slitting along line 22 would then obviously be made through this center ply of steel.

It is obvious that changes in the details of construction and in the steps in the method of forming the construction may be made without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. In a heavy duty fibre drum, a convolutely wound body wall including a continuous sheet of stock material forming one or more inner and outer plies of the body wall, and a pair of strips of light gage metal one thereof at each end of the body wall and together forming a circumferential partial ply of the body wall intermediately of said inner and outer plies, said strips forming said partial ply of metal being fixed on one side of the continuous sheet of stock material and integrally formed into the body wall as the body wall is convolutely wound.

2. In a heavy duty fibre drum, a convolutely wound body wall including a continuous sheet of stock material forming one or more inner and outer plies of the body wall, and a pair of strips of light gage metal one thereof at each end of the body wall and together forming at least one circumferential partial ply of the body wall intermediately of said inner and outer plies, said strips forming said partial ply of metal being fixed on one side of the continuous sheet of stock material each adjacent and parallel but spaced inwardly from an edge of said stock material, said strips being integrally formed into the body wall as the body wall is convolutely wound.

3. In a heavy duty fibre drum, as set forth in claim 2, including a bottom heading fitting into said body wall and secured thereto by forming said body wall into a holding bead, one of said strips of metal including a portion extending inwardly toward said holding bead and having a lower edge terminating within said stock short of the peripheral surface of said holding bead, said bottom head comprising a tray including a flange extending into said holding bead, and a circumferential chime member including one edge extending into said bead, the other edge of said chime member terminating along the body wall at a point below the upper edge of said one strip of metal.

4. In a heavy duty fibre drum, as set forth in claim 2, including an annular inwardly directed mounting bead formed about the upper edge of the drum and in the adjacent upper strip of sheet metal, a chime member circumposed about said bead and including a lower edge terminating above the lower edge of said upper strip of sheet metal, said upper strip of sheet metal having an upper edge terminating within said stock material short of the peripheral surface of said bead.

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