July 7, 1936. G. K. HOFF, JR 2,046,628

CONTAINER

Filed Feb. 24, 1933 3 Sheets-Sheet 1

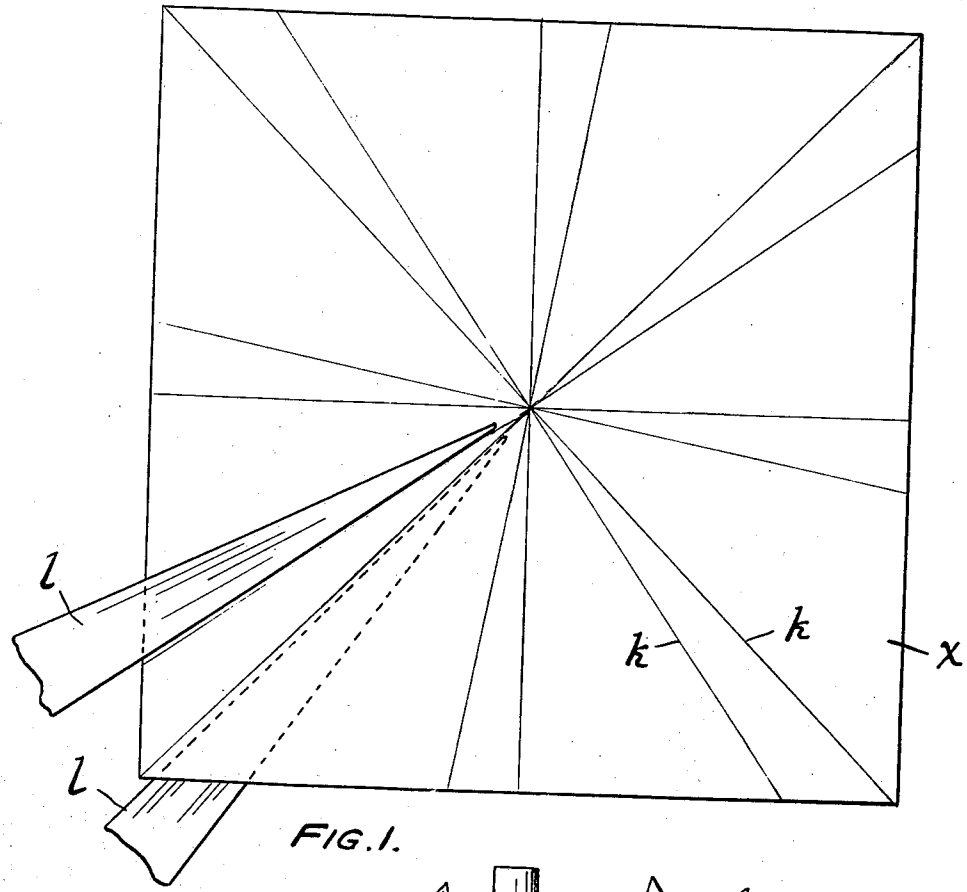


FIG. 1.

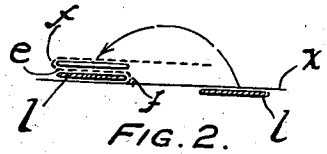


FIG. 2.

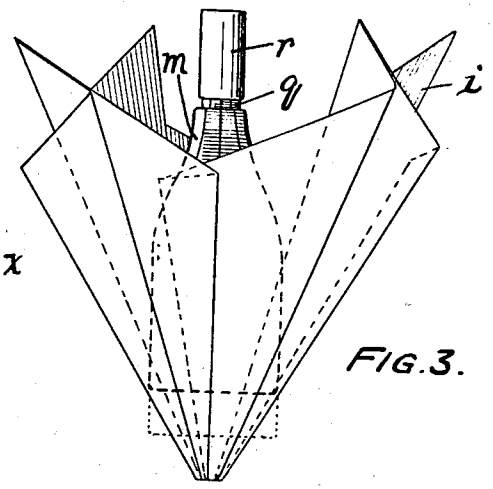


FIG. 3.

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July 7, 1936. G. K. HOFF, JR 2,046,628

CONTAINER

Filed Feb. 24, 1933 3 Sheets-Sheet 2

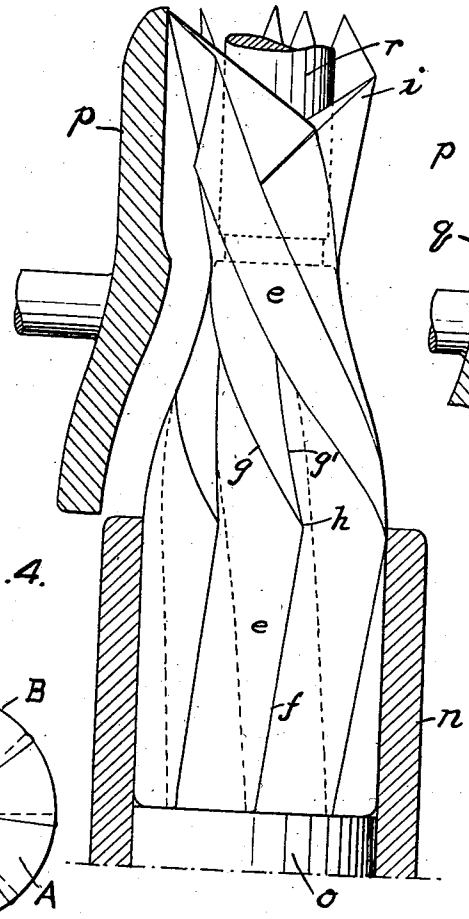


FIG. 4.

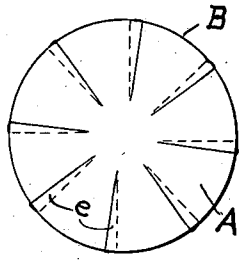


FIG. 7.

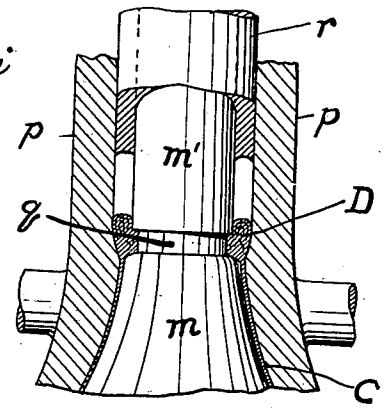


FIG. 5.

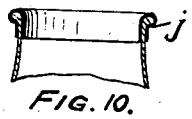


FIG. 10.

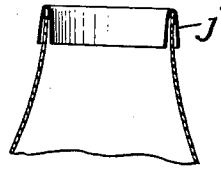


FIG. 9.

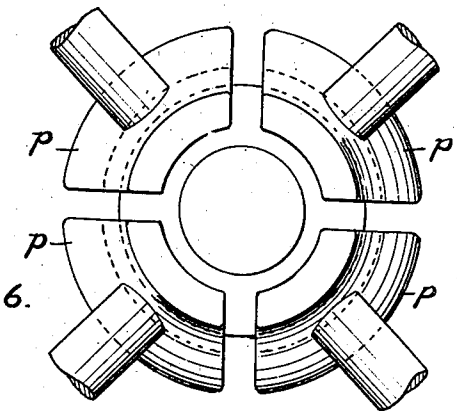


FIG. 6.

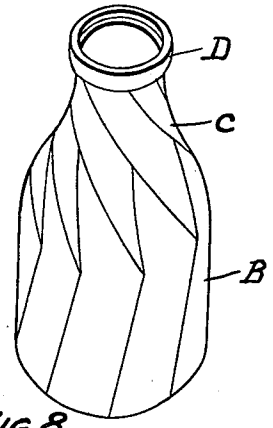


FIG. 8.

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July 7, 1936. G. K. HOFF, JR 2,046,628

CONTAINER

Filed Feb. 24, 1933 3 Sheets-Sheet 3

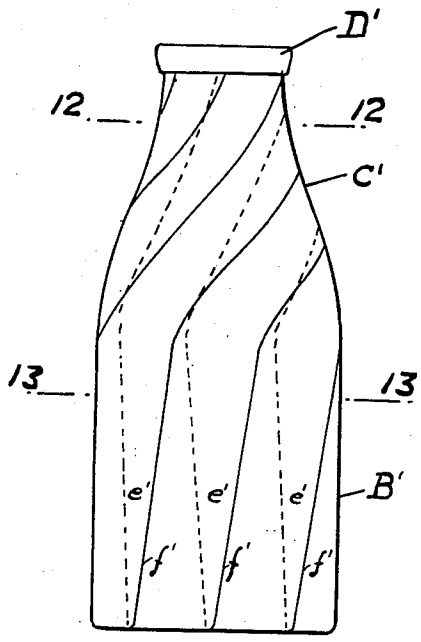


FIG. 11.

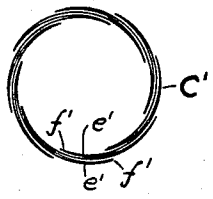


FIG. 12.

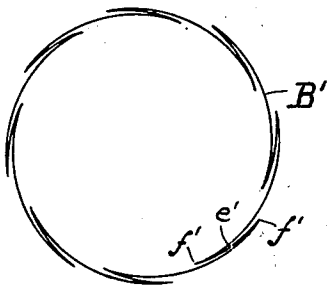


FIG. 13.

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Patented July 7, 1936 2,046,628

UNITED STATES PATENT OFFICE

2,046,628

CONTAINER

George K. Hoff, Jr., Philadelphia, Pa., assignor, by mesne assignments, to Florence R. Dalley, Haverford, Pa.

Application February 24, 1933, Serial No. 658,366

6 Claims. (Cl. 229—4.5)

This invention relates to an improvement in containers.

More particularly, this invention relates to an improvement in bottles and method for their production, and is more especially adaptable to milk bottles.

As is generally known there exists a demand for a container of the bottle type, and more especially in the form of a milk bottle, made from a material, as paper, or other fibrous sheet material, which would be light in weight and which would be of such small cost as to warrant its destruction when emptied, as compared with the substantial weight of the present glass milk bottles and the cost thereof, which renders necessary their collection and reuse after washing and sterilizing, which operations entail substantial expense, due more especially to the high cost of washing and sterilizing equipment.

Heretofore it has been attempted to supply the demand for a container of the milk bottle type by the provision of a bottle formed in a plurality of pieces, from paper, the pieces being joined to form the complete bottle. Such attempts, however, have failed to satisfactorily supply the demand since the cost of the completed bottle is excessive and its efficiency is low, more particularly in that requisite strength and absence of leakage has not been obtained.

Now in accordance with this invention a bottle formed from a single sheet of fibrous material, as paper, and a method for its production is provided.

The bottle in accordance with this invention will have requisite strength due to its structural characteristics, and will be completely leakproof due to its integral structure entirely free from any joints.

The method in accordance with this invention will be relatively simple in practice and may be carried out by hand, though it will be preferable for any substantial production to utilize some suitable form of apparatus for performing the various steps.

In general the bottle in accordance with this invention will be formed, for example, by pleating a sheet of paper of suitable dimensions from its center, drawing the pleated sheet about the body of a bottle form, the bottom of which is substantially centered relatively to the sheet and conforming the sheet to the body and neck of the form, and finally crushing and consolidating the excess material to the form of the lip of the bottle.

The paper sheet will desirably be impregnated with a suitable waterproofing material, for example, a wax, as paraffine, which will act to adhere the pleats, waterproof the fibrous material and give to the finished bottle a desired rigidity. Desirably the bottle will be formed with the impregnated sheet in a heated condition and when completely formed will desirably be coated interiorly, as by spraying, with a waterproofing material, as, for example, wax.

Having now indicated in a general way the nature and purpose of this invention, I will proceed to a detailed description of a preferred embodiment thereof with reference to the accompanying drawings in which:

Figure 1 is a plan view of a sheet of fibrous material for the formation of a milk bottle, with pleating indicated and a pair of pleating fingers shown.

Figure 2 is a diagrammatic sectional view indicating the formation of a pleat.

Figure 3 is a perspective view showing the application of a milk bottle form to the pleated sheet.

Figure 4 is a sectional view showing the pleated sheet conformed to a milk bottle form in association with retainers preliminary to forming the lip of the bottle.

Figure 5 is a sectional view showing a die and press for forming the lip of the bottle on completion of the lip forming operation.

Figure 6 is a plan view of segmental retainers for the upper or neck portion of the bottle.

Figure 7 is a plan view of the bottom of a finished milk bottle.

Figure 8 is a perspective view of a finished milk bottle.

Figure 9 is a sectional view of a modified form of lip at an intermediate stage.

Figure 10 is a sectional view of the modified form of lip completed.

Figure 11 is a side view of a modified form of milk bottle.

Figure 12 is a diagrammatic view on line 12—12 Figure 11.

Figure 13 is a diagrammatic view on line 13—13 Figure 11.

Referring more particularly to Figures 7 and 8, it will be noted that the bottle in accordance with this invention, which is formed from a single sheet of paper, comprises a pleated bottom A, pleated body B, pleated neck portions C and a crushed or compressed lip D. The pleats *e* beginning adjacent to the center of the bottom A extend generally radially of the bottom and continue upwardly of the body and neck, being

folded backwardly upon themselves in the neck portion in order to permit of the narrowing or tapering of the neck. As will be noted from an inspection of Figure 8, the pleats *e* extend upwardly of the body of the bottle with their free edges *f* at an angle to the axis of the bottle. From approximately the line of juncture of the body and neck or tapering portion of the bottle the pleats are folded backwardly upon themselves to compensate for the taper of the neck and extend upwardly of the neck or tapering portion of the bottle, presenting two free edges *g*, *g'*, which extend at an angle to each other from the point of beginning of the folds *h*, at approximately the juncture of the neck and body, and at an angle to the direction of extension of the edges *f* of the pleats in the body.

The lip D of the bottle is formed by compression and consolidation of the pleated excess *i* of the sheet, which extends beyond the neck portion of the bottle.

As will be noted the bottom of the bottle is strengthened or reinforced by the radially extending pleats and may be, and desirably is, formed concave or dished inwardly, for further strength. The body of the bottle is reinforced by the pleats *e*, and the neck portion, which takes the greatest strain, when lifting or pouring from the bottle, is doubly reinforced by virtue of the folding of the pleats upon themselves to compensate for the taper of the neck. Finally, the lip is rigid due to its formation by compression of the excess pleated paper. The lip, of course, is formed for the reception and retention of the usual milk bottle cap.

Referring now to Figures 11, 12, and 13 in which are shown a milk bottle of a modified structure from that shown in Figures 7 and 8, the bottle comprises a bottom (not shown) similar to that shown in Figure 8, a body portion B', a neck portion C' and a lip D'. The bottom and body B' are formed by conforming a pleated sheet to a form; while the neck portion C' is formed by increasing the size of the pleats *e* and extending them at a greater angle to the axis of the bottle, and in overlapping relation, in order to compensate for the taper of the neck portion. The lip D' is produced by crushing excess pleated material as in the case of the bottle shown in Figures 7 and 8.

In the formation of a bottle in accordance with this invention, as has been indicated, the sheet of fibrous material, as paper, light cardboard, or the like, or equivalent material, is desirability impregnated with wax, as paraffine, carnauba wax, beeswax, or the like, or other suitable waterproofing material which will also operate to adhere the pleats and generally stiffen the bottle. Where wax, for example, is used the pleating of the sheet and formation of the bottle is desirably carried out in the presence of heat. The bottle may be and preferably is, on completion of its formation, interiorly coated, as for example, by spraying, with wax or other suitable composition to stiffen it and insure that it will be waterproof and to give it a finished and sanitary interior. If desired the exterior of the bottle may be coated with any desired composition to further stiffen it and give it a desired finish.

Referring now to Figures 9 and 10, which illustrate a modified lip, some of the excess pleated material *i* is trimmed off, or a smaller sheet is used, and a metal rim *j* placed over the lip, as shown in Figure 9, and compressed with the excess pleated material to a form to receive the usual metal bottle cap, as indicated in Figure 10.

Referring now to Figures 1–6 inclusive, by which the procedure for the production of a bottle in accordance with this invention is illustrated, *x* indicates a sheet of fibrous material, as paper, a light kraft board, a suitable fabric, or other suitable material. The sheet *x* is desirably though not necessarily square and may be and desirably is impregnated with a wax, as paraffine, or other suitable waterproofing material of an adhesive character. *k*, *k* indicates lines upon which the sheet is pleated from its center, either by hand, or by suitable mechanical manipulation of fingers *l*, *l*, drawing through a pleating die, or otherwise.

The pleating is illustrated, for example, by Figure 2, from an inspection of which it will be observed that one of the fingers positioned beneath the sheet is brought over the other positioned above the sheet and the fingers then withdrawn leaving the pleat *e*.

The sheet *x* having been pleated as described, is drawn upwardly about a collapsible form *m*, which is centered with the sheet, as shown in Figure 3. The form *m* is so constructed as to collapse in order that it may be removed from the bottle when formed.

The pleated sheet is drawn upwardly about the form *m*, or alternatively the form is moved downwardly with reference to the sheet, until the bottom of the form is conformed with the central portion of the sheet to define the bottom A of the bottle without, however, destroying the pleats *e*, which will extend radially of the bottom of the bottle from adjacent its center, as shown in Figure 7.

The bottom of the form *m* having been conformed with the sheet *x* to define the bottom of the bottle, the sheet is conformed with the body of the form with the pleats *e* all folded in one direction, in the present case to the right, as shown in Figure 4, and having their free edges *f* extending at an angle to the axis of the body.

The sheet having been conformed to the body of the form a retainer *n* is applied to hold the pleats in their extension upward of the body of the form in place. The retainer *n* may be of any suitable construction and may be, for example, a ring of the height of the body of the form and adapted to encircle a base member *o* upon which the form may rest after formation of the bottom of the bottle and by which the pleats in the bottom may be held during the completion of the bottle.

The sheet having been conformed to the body of the form, the pleats *e* are folded upon themselves, the folds being made in reverse direction to that of the extension of the pleats throughout the body, and conformed to the neck portion of the form. The folding of the pleats upon themselves compensates for the taper of the neck portion of the form and permits conformation of the pleated sheet to the neck portion. In other words, the folding of the pleats upon themselves takes up the excess material arising from the taper of the neck as compared with the substantial cylindrical nature of the body.

When the sheet has been conformed with the neck portion of the form segmental retainers *p*, *p* are brought into engagement with the neck portion to retain the pleats during the formation of the lip D.

The retainers *p*, *p* may be of any suitable construction, but will desirably form extensions

of the retainer *n* and will extend well above the top of the form *m* to embrace the excess of the sheet *x* from which the lip will be formed. The retainers will also form with the upper end portion *m'* of the form *m*, which is grooved, as at *q*, a die for the formation of the lip, all as will be clear from an inspection of Figures 4 and 5.

The retainers *p* having been applied, an annular plunger *r* operating between the retainers *p* and the upper end portion *m'* of the form will operate to crush the excess material *i* down and into the groove *q* for the formation of the lip D, as will be clear from an inspection of Figure 5, which shows the plunger *r* retracted after the formation of the lip.

Apparatus and procedure similar to that above described may be used for the formation of the form of bottle shown in Figures 10, 11 and 12, it being noted, however, that the pleats in the neck portion C' are carried through the neck portion at an increased angle, and with increased size, and in overlapping relation as compared with folded each upon itself as in the case of the form of bottle shown in Figure 8.

It will now be appreciated that the bottle in accordance with this invention is distinguished, from the broad standpoint, by the fact that it is formed from a single sheet of material, as a felted fibrous material, as paper, or other suitable or equivalent material. In more specific embodiments the bottle involves a pleated structure and is provided with a lip formed by compressing and consolidating or agglomerating a portion of the material from which the bottle is formed, with or without the addition of a separate lip member. Further, the material from which the bottle is formed may be and desirably is impregnated with any suitable waterproofing and stiffening material, which where a pleated structure is used desirably will also act to adhere the pleats, and may be interiorly, and if desired also exteriorly, coated with any suitable material to further stiffen and waterproof and/or give desired finish.

The method in accordance with this invention is distinguished from the broad standpoint by the conforming of a single sheet of material to a form for the formation of a bottle, the sheet being suitably waterproofed and stiffened. More specifically the method contemplates the pleating and conforming of a single sheet of material to the form of a bottle and the formation of a lip thereon by compression, consolidation or agglomeration of a portion of the sheet of material of which the bottle is formed.

What I claim and desire to protect by Letters Patent is:

1. A bottle formed from a single sheet of fibrous material and comprising a bottom portion, a body portion, a tapering neck portion and a lip, the sheet of fibrous material being pleated from adjacent the center of the bottom through the body and neck portions and compressed to form the lip.

2. A bottle formed from a single sheet of pleated, felted fibrous material comprising a bottom, a body, a tapering neck and a lip, the pleats extending from adjacent the center of the bottom through the body and neck and being folded upon themselves in the neck portion.

3. A bottle formed from a single sheet of pleated, felted fibrous material comprising a bottom, a body, a tapering neck and a lip, the pleats extending from adjacent the center of the bottom through the body and neck at an angle to the axis of the bottle and being in overlapped relation in the neck portion.

4. A bottle formed from a sheet of pleated, felted, fibrous material comprising a bottom, a body, a tapering neck, and a lip, the pleats being folded back upon themselves in the neck portion.

5. A receptacle formed from a single sheet of fibrous material and comprising a bottom portion, a body portion and a lip, the sheet of fibrous material being formed into pleats running radially in the bottom portion and extending through the body portion and being compressed to form the lip.

6. A receptacle formed from a single sheet of fibrous material and comprising a bottom portion, a body portion and a lip, the sheet of fibrous material being formed into pleats running radially in the bottom portion and extending through the body portion and having its free end portion crushed and consolidated by vertical compression to form a lip of homogeneous structure throughout integral with and in extension of the body.

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