Dec. 4, 1934. M. E. GAZETTE 1,983,361

CONTAINER MADE OF PAPER AND METHOD OF PRODUCING IT

Filed Oct. 27, 1933 2 Sheets-Sheet 1

Fig. 1.

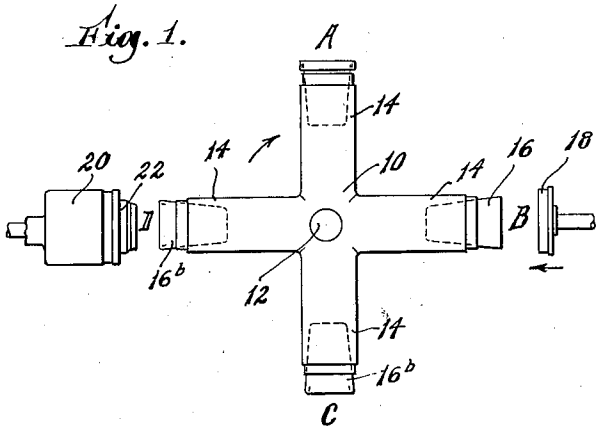


Fig. 2.

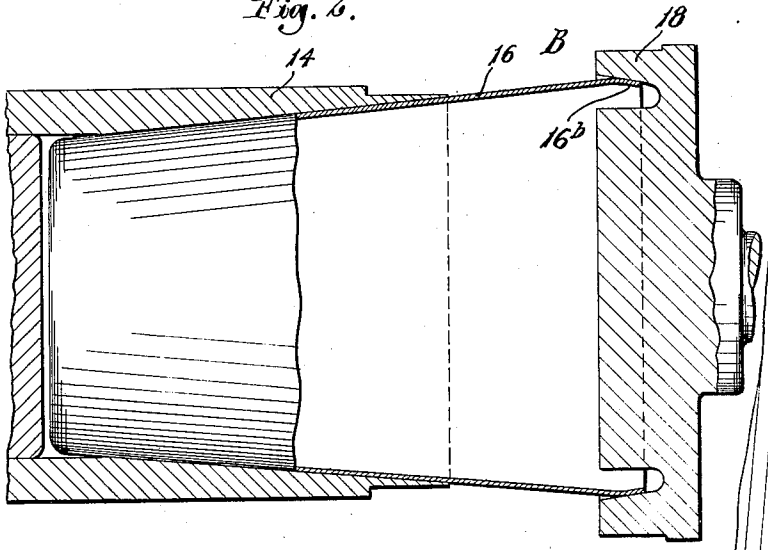
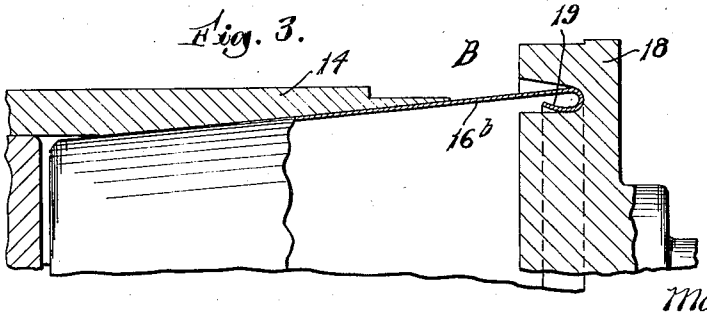


Fig. 3.



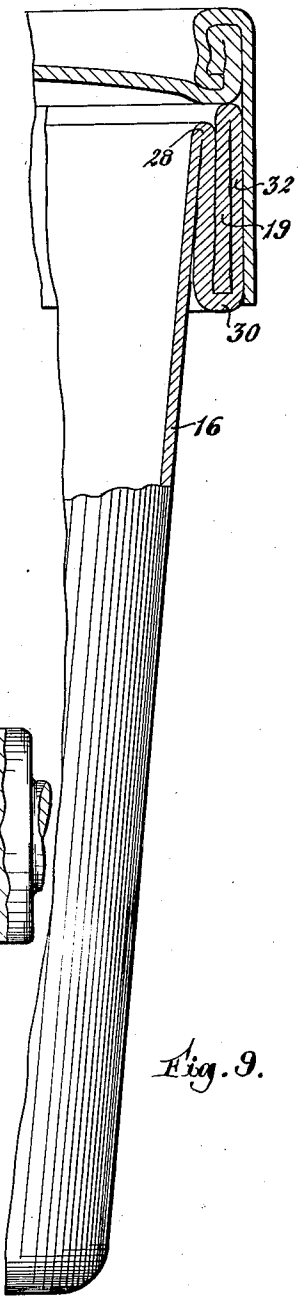


Fig. 9.

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CONTAINER MADE OF PAPER AND METHOD OF PRODUCING IT

Filed Oct. 27, 1933 2 Sheets-Sheet 2

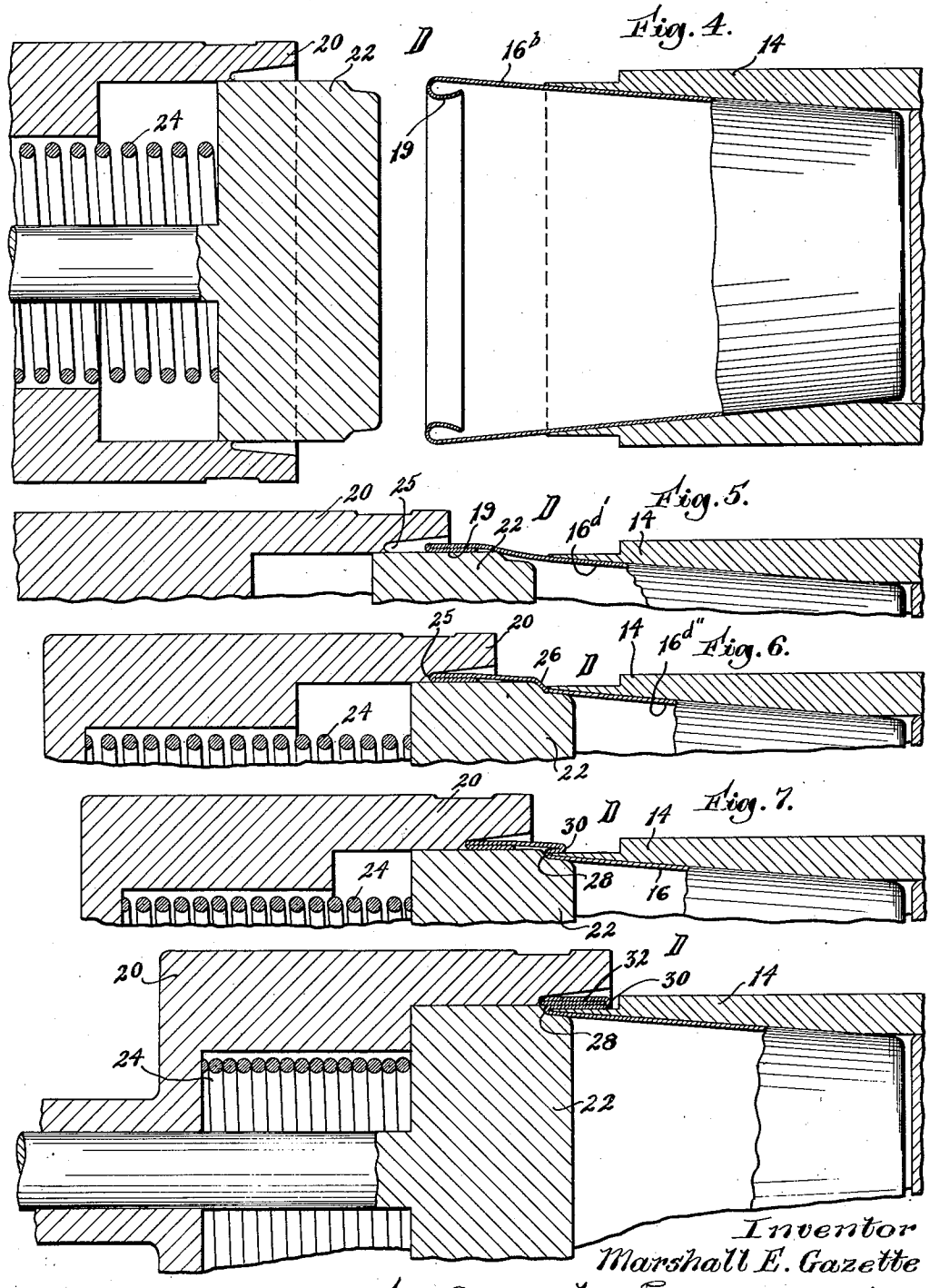


Fig. 8.

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Patented Dec. 4, 1934 1,983,361

UNITED STATES PATENT OFFICE

1,983,361

CONTAINER MADE OF PAPER AND METHOD OF PRODUCING IT

Marshall E. Gazette, Boston, Mass., assignor to Boothby Fibre Can Company, Boston, Mass., a corporation of Massachusetts

Application October 27, 1933, Serial No. 695,438

5 Claims. (Cl. 93—36)

This invention relates to improvements in containers made of paper and methods of producing them.

More especially it relates to tapering containers which can nest together. It provides for such a container an improved top end for receiving either an exterior or an interior closure cap. It provides a method by which a relatively broad annular section of the walls of a tapering tube at or near the larger end may be transposed bodily, in axial direction, into encircling relation to an adjacent section of that same tube. The transposed section, which may be made to approximate cylindricality, provides an exterior smooth annular surface or seat for a close fit of the cylindrical flange of a cap cover.

Cans of the tapered body type have a distinct advantage over cylindrical cans in that they can be nested together for conservation of space, for shipping and for storage. And an outside-fitting flanged cap type of closure is better than the inserted-disk closures which are generally used for tapered containers. It is more effectively and durably tight, against leakage of liquid; and it may be applied more readily, and with greater safety against slopping out of contents.

One thing which the invention does is to provide a cylindrical cap-receiving multi-plex protruding rim at the larger end of a tapering tubular body made of paper, without materially disturbing the structural organization of fibres in that portion of the wall which is thus made cylindrical.

Important features reside in the retaining of approximately the full stiffness and strength of the original paper stock while providing due precision of size in this transposed cylindrical ring; and in softening and thickening the interjacent paper stock which is made to intervene as a cushion between that ring and the container body.

For describing the method of producing said rim, which is illustrated as a quadruplex product of the original paper stock, it is convenient to consider the depth of the finished rim, in direction of the axis, as a "unit" of measurement, and to speak of the first, second, third and fourth units of measurement inward from the larger end of the original tapering tube as successive "sections", although it will be understood that there are no dividing marks between them, nor other differences except such as are constituted by performing the operation or process which distinguishes these sections from each other in the final product.

The first step is to crimp inward the endmost annular section of the tube, starting at its edge and causing the infold to proceed progressively through this section to whatever depth may be adopted as the unit of rim depth, which then constitutes the end of the section in axial direction. The first section is thus laid within and closely parallel to the second section of original depth of stock. This makes a duplex end portion, in which the said second section is directly continuous with the third and fourth sections. It is advisable next to expand radially the third section while guarding the fourth from having its original size increased. This offsetting of the third section from the fourth introduces a radial shoulder between these two sections, such that upon endwise compression of the whole tube, tending to thrust the offset third section past the fourth, paper stock yields at this shoulder, which becomes a duplex reverse fold. The fourth section continuing to be firmly held, and the pressure continuing, the first, second and third sections move along outside of the fourth section to a circumjacent position. As one edge of the third section continues integral with the fourth section, the effect is that the fold between third and fourth sections travels along through the body of the third section until it reaches the juncture of the third section with the second section, at which time the rim is complete with the first and third sections lying between the second and fourth. With this method of construction the exterior of the rim is the undisturbed stock of the original wall at the second section, and its interior is the undisturbed stock of the original wall at the fourth section, and the stock of the interjacent first and third sections has been softened and thickened by the sharp bending which has traversed the whole of each of those sections.

This construction provides a definite shoulder at the lower edge of the transposed ring, constituting an abutment for engaging the top edge of another container in which the first may be nested, as a positive stop for the nesting, whereby the nested containers inter-engage loosely, with none of the binding and wedging which sometimes make it difficult to separate nested containers of prevailing types.

The above objects and results may be attained with a tapering tube made of paper, the smaller end of which may be permanently closed in any suitable way, as by a crimped-in closure disk.

The multi-plex rim thus formed is not necessarily four-fold. It would be only three-fold if the initial in-turning were omitted. Nor is the process limited to the preparation of a rim for

an exteriorly engaging cylindrically flanged cap, for a disk closure may be used, and if the in-turning of the fold be arrested, and the reverse folding between third and fourth sections be arrested, at proper places, the disk can be seated on the fourth section and its edges engaged under the edge of the in-turned first section.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings:

Figure 1 is a diagrammatic plan of apparatus by which the method of the invention may be practiced;

Figure 2 is an enlarged view, in plan or elevation, and in medial section, of a tube-holding fragment of the carrier of Figure 1, and of the crimping die shown at the right in Figure 1 at station B thereof, the die having moved into engagement with the tube end;

Figure 3 is a view similar to Figure 2 with the crimping die further advanced, and showing the first section of the tube end turned inward;

Figure 4 shows the tube-holder of Figure 3 swung through 180° of Figure 1 to station D, to stand with the tube mouth opposite the stretching and transposing mechanism;

Figure 5 is a view similar to Figure 4 but having the stretching and transposing mechanism advanced toward the holder, and with the stretching plunger engaged within the tube mouth, flattening the first section inside of the second section, to make a duplex edge;

Figure 6 is a view similar to Figure 5, at a subsequent stage with the plunger at its inmost limit of travel having expanded the third section and outset it from the fourth, and with the duplex tube end butted against the transposing die;

Figure 7 shows an initial stage of the axial transposition of the paper walls, the plunger being at rest, while the transposing die has moved along it, toward the tube holder, converting the shoulder into a reverse duplex fold within the third section, while the plunger is pinching the stock at the inner corner of the shoulder and holding the fourth section stationary;

Figure 8 illustrates the final stage in the transposition, with the transposing die at the inmost limit of travel, and

Figure 9 is an enlarged elevation, partly in medial section, of a fragment of a completed container, with a flanged cap-cover applied.

Referring to the drawings, the illustrated apparatus, for forming my improved cylindrical multiplex rim on a conical tube of paper, is one industrially practicable means whereby the invention may be carried into effect. But as it is the bodily transpositions and interfibrous modifications of annular portions of wall into certain relations, which produce my novel results, the particular apparatus employed is not claimed in this patent.

In Figure 1 a tube carrier 10, rotatable on a vertical axis 12, has any suitable number of tube-receiving sockets 14, four being shown. Each socket is taken progressively to stations A, B, C and D. At station A a completed container is shown ready to be removed. A tapering tubular body 16 which is to undergo the treatment is to be put into its place at station A; and the next step rotation of the carrier 10 will advance this tube 16 to station B where the carrier 10 holds its tube at rest while the die 18 advances upon it endwise. An early stage of its crimping engagement with the projecting end of the tube is seen at $16^{b'}$ in Figure 2, and its final stage at 16^{b} in Figure 3. This die, which turns the end of the first section of the tube inward, may be of a spinning variety which operates with a gradual lengthening of the in-turned annular portion or in-fold 19. The crease of the fold traverses all the stock of this section as the crimping proceeds. The fibrous structure of the entire in-fold section 19 is thus materially disrupted, rendering it relatively soft and spongy. When the desired depth of in-fold has been attained, as in Figure 3, die 18 may be withdrawn, and carrier 10 to be rotated to advance each holder 14 one station.

No operation is performed at C station, but the tube 16^{b} with the infolded first section 19 may be inspected, and at the same time a fresh tube may be inserted in the holder at station A; and operations are meanwhile being performed at B and D.

At station D the tube is subjected to a compound treatment. A transposing member or die 20 carries a stretching plunger 22, which backed by spring 24, is yieldable in the die 20 to permit that die to continue travel after the plunger has been stopped. As die 20 advances toward the tube 16^{b}, the initial engagement of the plunger 22 causes a flattening of the in-fold 19, to shape $16^{d'}$ as illustrated in Figure 5, making a stiff duplex combination of the first and second sections. Further travel of the plunger effects a circumferential stretching of the tube walls to an enlarged diameter which is approximately uniform in the latter part of the third section, i. e., the zone next to the infold 19, except for the rather abrupt oblique shoulder which is formed by this stretching as at 26 in Figure 6, at the juncture of the stretched third section with the unstretched fourth section. The length of initial projection of tube 16 from its holder 14 at station D determines the extent in axial direction of the stretched zone of walls, since the plunger 22 comes to rest only upon encountering the holder 14 as an obstruction, whereupon the inner part of the shoulder 26 becomes pinched between the plunger and this holder 14. The tube of this stage of the process is marked $16^{d''}$.

With continued pressure, at this stage, the plunger spring 24 yields; and the transposing die 20 continues forward. The annular socket 25 in the leading end of this die engages the doubled end of the tube and applies endwise pressure to the duplex wall of the tube. With this set up the buckling occurs at the outer part of the shoulder 26 where the third section is outset from the fourth and where the paper stock has been somewhat weakened by the stretching. There the inner annular part of the shoulder is backed by the thin edge of the holder 14, and the outer annular part of that shoulder is unsupported. It is to this outer part that the pressure of the advancing die socket 25 is directly transmitted. This holder edge preferably will approximate a knife edge, as seen in Figures 2–8 but must not be a cutting edge. Under this annular pressure the outer part of the shoulder yields and lets the third section move to a position circumjacent to the fourth section, becoming inverted as it so moves. The stock becomes annularly folded over the edge of holder 14, as represented in Figure 7, and also develops a reverse fold like an S. The fold 28 where the stock turns over the edge of its support 14, being fixed in position, the outer fold or crease 30 has to travel until the stroke of die 20 ends. The dimensions are so designed that

the stroke ends at that moment when this fold 30 reaches a distance beyond the fold 28 about equal to the breadth of the duplex portion containing the inturned fold 19 as seen in Figure 8. The abrupt fold or crease 30 moves along directly upon the exterior of holder 14, and traverses every portion of the third section thereby structurally disrupting the microscopic relations between its fibres and converting it to a soft and spongy texture, less dense and appreciably thicker than the stock in its original and normal state. This condition is represented in Figure 9 by the irregularly thicker portrayal of the third section. As the infold 19 was made of corresponding soft and spongy texture at station B, these intermediate layers of the quadruplex run combine to provide a resilient, cushioning, annular support for the ring seat 32, permitting the seat to yield a little for the applying or removing of a closely fitting flanged cap, and tending to maintain a tight engagement between the cylindrical seat 32 and the cylindrical flange of the cover.

The lower edge 30 of the rim thus made presents a relatively broad, annular shoulder for abutting against the top edge of the rim of another like container in which it may be nested. It definitely limits the degree to which one container may sink within another, with no possibility of the two becoming wedged together.

With the apparatus thus described, the operation is that the original tapering tube is held in a suitable carrier, being a conical cup from which the end of the tube projects, while its end section is spun inward by a suitable crimping die, making a duplex lip at the mouth; through which mouth a plunger then advances for circumferentially stretching the walls beyond the duplex lip, making them and the duplex portion approximately cylindrical. The plunger comes to rest pinching the tube against the thin edge of the conical cup support, and this makes a rather abrupt radial shoulder in the tube wall, from its stretched portion to its unstretched portion within the support. But as the plunger is only an advance portion of the die, held out by a spring, the arresting of the plunger does not arrest the die. The continued progress of the die engages edgewise the duplex lip, and pushes that lip section bodily along in axial direction until it lies in position circumjacent to the supported portion of the tube wall. During this movement the intervening third section of wall crumples regularly, beginning at the shoulder and edge of the support, where the paper stock is outset, and is weakened by being stretched, and finally lies inverted along the outside of the tubular support, which at this place is very thin so that its later withdrawal leaves very little space. It may be even thinner than is represented in the drawing.

The expanding plunger preferably will have diameter slightly greater than the exterior diameter of the tube carrier, so that the inturned portion 19 of the lip which has been reenforced by being made duplex will pass readily to the outside of the inverted third section.

The axially directed transposing pressure illustrated as being applied by a die having an annular socket for engaging the duplex lip, may be applied by any suitable means.

Although this improved container is especially designed for receiving the flanged cap type of closure, the process may be used for making a container adapted for disk closure. By stopping the transposing die 20 a little short of the position of Figure 8, a compound top edge may be formed, with the tapering body ending at the fold 28 and with the infold 19 standing further outward and constituting the very top edge. Then either an insertible disk closure may be pressed within the projecting portion of ring seat 32, to seat against the edge 28, or to catch under the inturned edge 19, or the preferred flanged cap closure may be applied exteriorly.

Other advantages result from the invention. The exterior cylindrical surface which is to receive the cap flange retains approximately all of its original stiffness, strength and smoothness. Its structural organization is undisturbed, beyond being slightly expanded, because it has undergone only a transposition bodily in axial direction, from one location to another, as distinguished from being crumpled by being crimped or turned inside out.

In the case of decorated containers, the initial tapering tube may be printed or otherwise treated, and the finished container will have its cylindrical seat of the same decorative design or color as the body.

In the claims, the annular multi-plex portion of tube walls is called a "rim" although its location is not necessarily at an end of the tube.

I claim as my invention:

1. The method of forming a cushioned approximately cylindrical seat at the larger end of a tapering tubular body of paper or the like whose walls are uniformly single thick around the tube, comprising the stretching of the stock of the paper of a tapering tube at and adjacent to its larger end to approximate cylindricality, and then annularly and progressively folding together the adjacent expanded and unstretched portions of the paper stock of the tube, with the progression of the folding beginning at the juncture of stretched with unstretched portions, the fold being compound of Z-form having one limb of the Z supported against recession, thereby, with the continuance of the progressive folding causing one annular crease of the compound fold to travel along the paper stock of the other limb of the Z-fold, with loosening of the fibrous structure thereof by the sharp bending thereof, the said folded stock being thereby deposited intervening as a cushion between the unstretched portion of wall and an encircling part of the stretched portion of wall.

2. A container made of paper or the like, comprising a tubular body having an approximately cylindrical enlargement at one end, said enlargement comprising an intermeshed infold and outfold, in each of which the relations of fibres in the paper have been loosened, within an axially transposed intact encircling ring.

3. The method of forming a rim on a tube of paper or the like whose walls are uniformly single thick around the tube, comprising the stretching and outsetting of an annular portion of paper stock, circumferentially and radially, into an approximately cylindrical form whose diameter slightly exceeds the diameter of the adjacent part of the tube, and then holding the said annulus outset and meanwhile pressing axially endwise thereon, outside of and axially against the remainder of the tube, and so everting a part of the said annulus outside of an adjacent portion of the said tube, and simultaneously transposing a remainder of the annulus by pressing the said remainder along the everted part, in tightly overlapping relation thereto, the everted part

constituting a guide and support for said remainder.

4. A container formed from a tube of paper or the like, comprising walls which are free from folds extending longitudinally; a body portion of said walls being single thick around the container; and a rim portion of said walls being plural thick around the container; one said thickness in the rim portion being an everted part of the tube wherein the paper is interfibrously and resiliently stretched from its natural state; and another said thickness in the rim portion being an everted part of the tube similarly stretched to the extent that it constricts the first said everted part resiliently and tightly.

5. A container formed from a tube of paper or the like comprising walls which are single thick in a body portion and having a plural thick rim wherein the paper stock is stretched interfibrously and resiliently to diameters greater than it had in the initial tube; one thickness of the rim having its fibrous structure loosened and being in encircling relation to an adjacent normal portion of the tube, and another thickness of said rim tightly engaging around said loosened thickness.

MARSHALL E. GAZETTE.