

Dec. 2, 1947.

F. LA GRUA

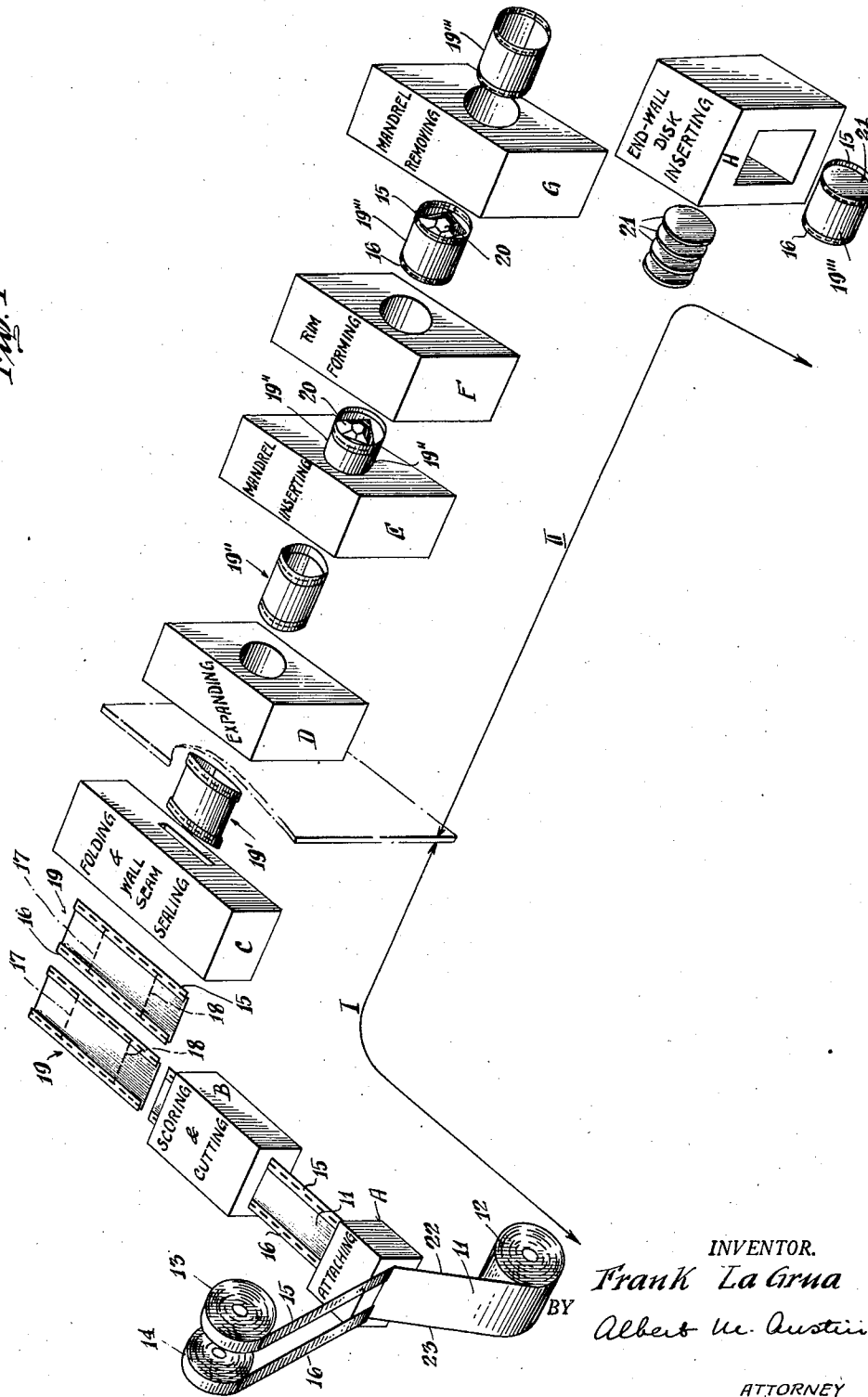
2,431,697

COLLAPSIBLE CONTAINER AND METHOD OF MAKING THE SAME

Filed June 29, 1944

3 Sheets-Sheet 1

Fig. 1



INVENTOR.

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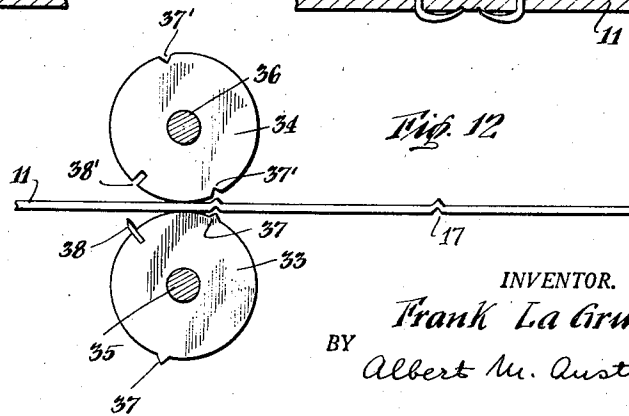
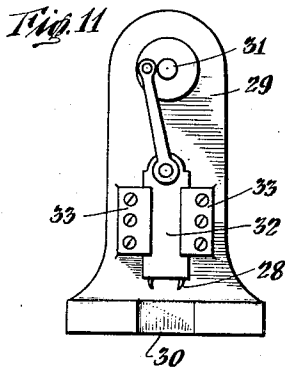
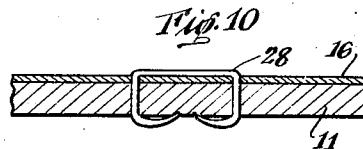
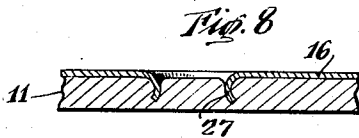
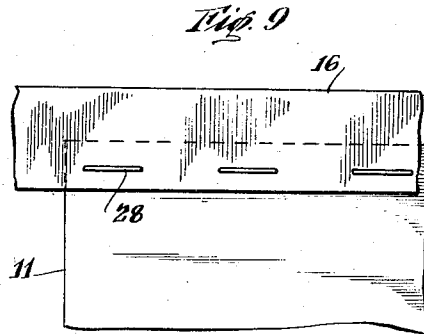
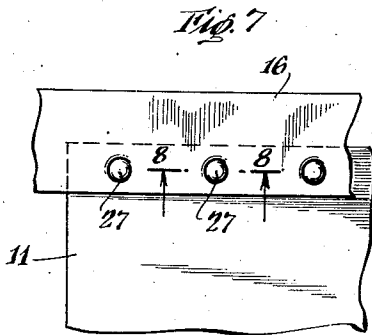
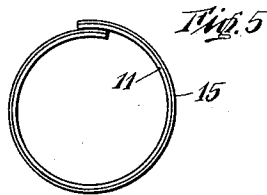
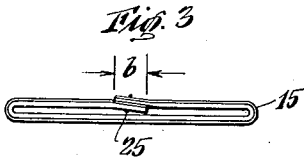
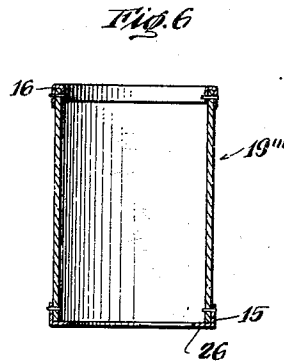
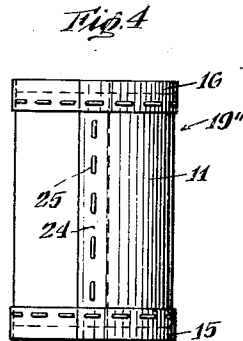
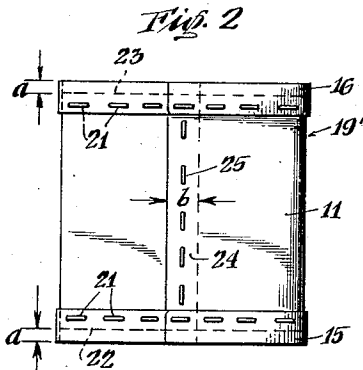
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COLLAPSIBLE CONTAINER AND METHOD OF MAKING THE SAME

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3 Sheets-Sheet 2



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COLLAPSIBLE CONTAINER AND METHOD OF MAKING THE SAME

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3 Sheets-Sheet 3

Fig. 13

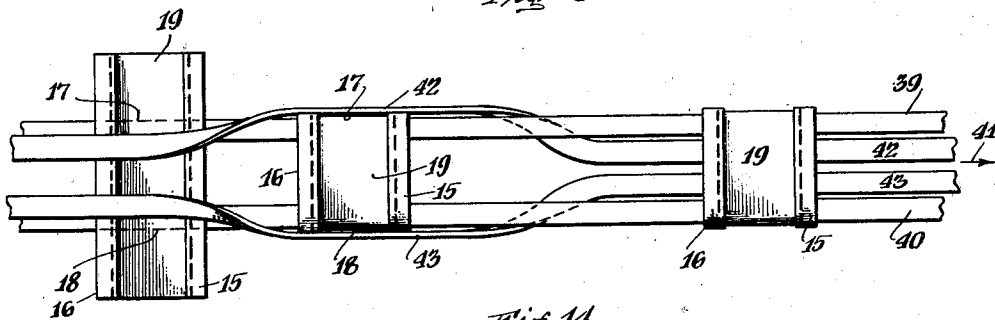


Fig. 14

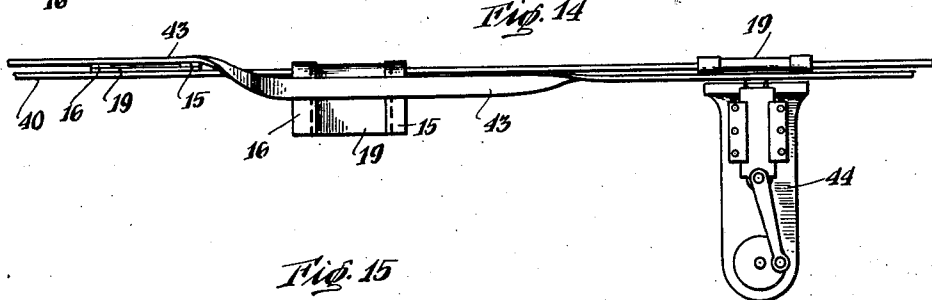


Fig. 15

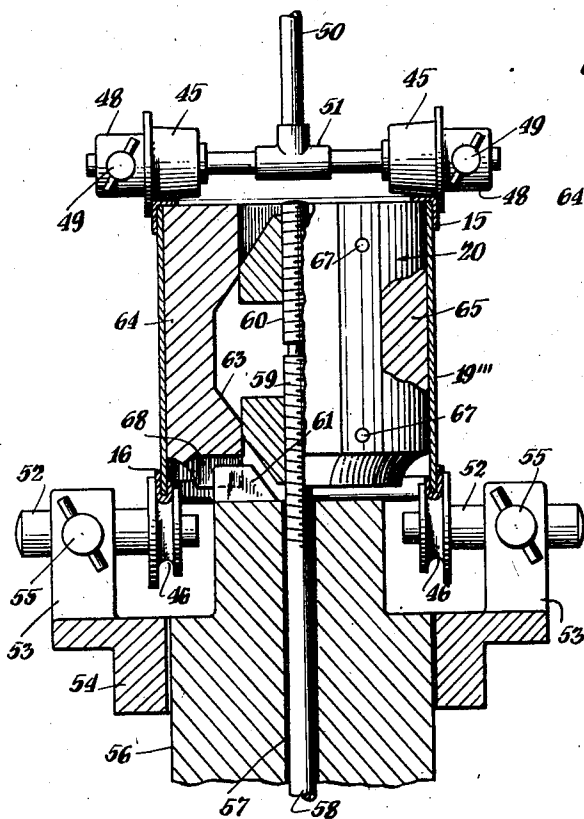


Fig. 16

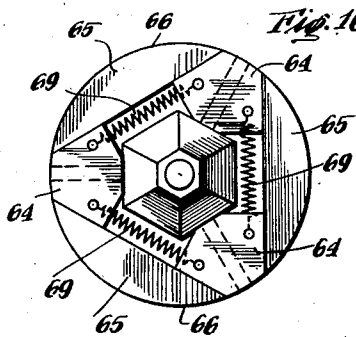
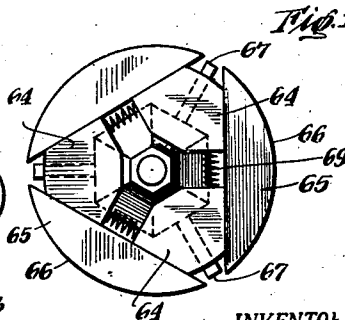


Fig. 17



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COLLAPSIBLE CONTAINER AND METHOD OF
MAKING THE SAME

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9 Claims. (Cl. 93—39.1)

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This invention relates to the manufacture of collapsible containers made from cardboard, paperboard or other suitable material, capable of being folded flat to reduce the cost of transportation of the empty container from the container manufacturer to the user, for example, to manufacturers of food products, chemicals or similar merchandise.

The invention provides a method of making a collapsible container which is strong and rigid and will withstand the rough handling to which containers of this type are frequently subjected. The container consists of several parts which may be shipped flat to reduce the space required for shipment. The flat container may easily be opened up into cylindrical, oval, oblong or similar form, is then acted upon, as to fix its expanded form so as to resist collapsing or deformation and is then ready for filling with merchandise.

The container made according to my method has a foldable tubular wall provided with reinforcements along its upper and lower edges which after opening of the container into cylindrical form according to my method are intumed to render the container extremely rigid and capable of withstanding considerable abuse in shipment and handling.

The container may be produced at high production rates from continuous rolls of cardboard, paperboard, or other suitable foldable material which in the process of manufacture is combined and reinforced with strips of edging of a material of greater strength and less deformability, under ordinary use than paperboard or cardboard, but capable of being formed into definite shape by the use of tools. Such edging may be made of soft carbon steel, aluminum or other metal or a plastic. The reenforced continuous band of board is then scored and cut into individual blanks, the ends of which are folded along two score lines and secured together to form flat tubular structures ready for shipment to the user at whose plant the collapsed blanks are expanded into cylinder form.

After expansion of the collapsed blank the reinforcing edging of the blank is turned in so as to form inwardly extending projections. The projections fix the form of the container, make the container walls resistant to deformation and serve as a ledge for supporting an end wall disk or closure.

After insertion of a bottom wall disk the container is ready for filling and closing with a suitable cover which may have the form of a flat disk or may be of the telescoping type having a

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cylindrical rim or wall fitting over the top portion of the container.

The aims, objects, and advantages of the invention will appear more fully from the detailed description which follows accompanied by drawings showing for the purpose of illustration a manner in which the invention may be practiced.

The invention also consists in certain new and original features of construction and combination of parts and steps hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out may be better understood by referring to the following detailed description taken in connection with the accompanying drawings forming a part thereof in which:

Fig. 1 is a diagrammatic illustration of successive steps for forming a container according to this invention;

Fig. 2 is a side view of a flat tubular container blank;

Fig. 3 is an end view of the blank shown in Fig. 2;

Fig. 4 is a side view of an expanded tubular container blank;

Fig. 5 is an end view of the blank shown in Fig. 4;

Fig. 6 is a sectional side view through an expanded tubular container blank after the reinforcing or fixing operation;

Fig. 7 illustrates a manner in which edging may be attached to board by rivets formed from the edging;

Fig. 8 is a section taken on line 8—8 of Fig. 7 on an enlarged scale;

Fig. 9 illustrates a manner of attaching edging to board by staples;

Fig. 10 is a section taken on line 10—10 of Fig. 9 on an enlarged scale;

Fig. 11 is a simplified diagrammatic illustration of a stapling machine for attaching edging to board;

Fig. 12 is a simplified diagrammatic illustration of a machine for scoring and cutting blanks from a continuous band of material;

Fig. 13 is a plan view of equipment for folding blanks into tubular form;

Fig. 14 is a side view of the equipment shown in Fig. 13;

Fig. 15 is an elevational view, partly in section, of a rim forming device;

Fig. 16 is a plan view of a mandrel forming part of the rim forming device, the mandrel being shown in expanded condition; and

Fig. 17 is a plan view of the mandrel in contracted condition.

In the following description and in the claims various details will be identified by specific names for convenience. These names, however, are intended to be as generic in their application as the art will permit. Like reference characters refer to like parts in the several figures of the drawings.

In the accompanying drawings forming part of this specification certain specific disclosure of the invention is made for the purpose of explanation, but it is understood that the details may be modified in various respects without departure from the broad aspect of the invention.

Fig. 1 illustrates diagrammatically a series of steps by means of which a cylindrical container may economically be formed according to my invention.

A continuous band 11 of suitable foldable material, such as cardboard, paperboard and the like, is unwound from a supply roll 12. Rolls 13 and 14 contain continuous ribbons or strips 15 and 16 of flat thin edging capable of being formed or bent into definite shape by appropriate tools. Edging may suitably be made of soft carbon steel, aluminum or other metal, or of a plastic composition formable under pressure or pressure and heat. In the specific example illustrated the edging consists of a thin metal band. The board 11 and the edging 15 and 16 are continuously fed into suitable mechanism at station A for attaching the edging 15 and 16 to the side edge portions of the board 11 so that the outer edges of the edging project over the outer edges of the board. The edging may be attached by bonding with an adhesive compound or secured mechanically by riveting, stapling, or a similar way. Machines for performing such attaching operations are available in the industry and do not per se form a part of this invention.

A continuous band consisting of board 11 and the attached edging 15 and 16 leaves the station A and is fed into a station B containing scoring and cutting mechanism. The continuous band 11, 15 and 16 is scored transversely at 17 and 18 and is cut into individual blanks 19.

The blanks 19 leaving station B are advanced to a station C in a direction substantially at right angles with respect to the direction of travel of the band 11, 15 and 16.

At station C the blanks 19 are folded along the score lines 17 and 18 so that the ends of the blank including the edging 15 and 16 overlap. The overlapping portions of the blank are then secured together by adhesive or by mechanical means, such as staples, rivets, or the like, resulting in flat tubular blanks 19' which may be staked and shipped in collapsed condition to the user of the container who will expand the tubular blanks into predetermined form as will be presently described.

The series of operations carried out at stations A, B and C are usually performed at the plant of a box or container manufacturer and are collectively designated in Fig. 1 by an arrow line I.

At the plant of the merchandise manufacturer, the tubular collapsed blanks 19' are expanded into cylindrical form at a station D by suitable equipment readily available in the industry.

The expanded cylindrical blank 19'' leaves station D for a further operation at a station E

where a collapsible and expansible round mandrel 20 is inserted into the expanded blank 19''. Expansible mandrels suitable for this purpose are available in the industry.

The tubular blank 19'' and the mandrel 20 support the blank 19'' during a succeeding forming operation performed at the edging. Blank 19'' and the mandrel 20 are advanced to a further station F at which the portions of the edging 15 and 16 which extend beyond the edges of the board 11 are turned inwardly so as to form an inwardly projecting ledge or flange fixing the shape of the expanded container blank. Preferably the strip 15 is inturned so as to form a reinforcing rim of L-shaped cross section and the strip 16 is inturned so as to assume J-shaped cross section. The inwardly extending ledge formed by the rim 15 later serves as a support for a flat disk forming the bottom of the container as will presently appear while the strip 15 forms a reinforcing top rim on the container.

After the rim forming operation the container blank 19''' and the mandrel 20 are advanced to a further station G at which the mandrel is collapsed to assume a reduced diameter for removal from the interior of the container.

The cylindrical blank 19''' is finally advanced to a last station H at which an end wall disk 21 is inserted. The disk 21 rests upon the L-shaped flange formed on the bottom strip or rim 15.

The container 19''', 21 is now ready to receive merchandise, and may be closed either by insertion of a flat top disk or by means of a telescoping cylindrical cover which may be formed in the same manner as the container.

In Figs. 2 and 3 a collapsed tubular blank 19' is shown. The blank comprises a tubular side wall 11 of cardboard, paperboard, or other foldable material, and strips 15 and 16 attached to the board at 21 so as to overlap the side edges 22 and 23 of the board by a margin *a*. The ends of the board 11 and of the strips 15 and 16 overlap by a margin *b* and form a seam portion 24, the ends of the board being secured together at 25.

Figs. 4 and 5 illustrate the blank 19'' after expansion into cylindrical form prior to the rim forming operation.

Fig. 6 shows the blank 19''' after the rim forming operation. The top strip 16 has been turned inwardly so as to form a stiffening rim of substantially J-shaped cross section around the top edge of the container wall. The bottom strip 15 has been inturned so as to form an inwardly projecting ledge or flange 26, the cross section of the metal rim resembling an L.

The flat strips 15 and 16 may be attached to the band 11 of cardboard or paperboard in various well-known ways.

Figs. 7 and 8 illustrate a method of riveting in which rivets 27 are formed from a metal strip 16 itself by suitable punching tools, and are impressed into the board 11 as illustrated in enlarged cross section in Fig. 8.

Figs. 9 and 10 illustrate a manner of attaching edging 16 to board 11 by staples 28, an enlarged cross section being shown in Fig. 10.

A stapling machine for attaching strips to board is illustrated in simplified diagrammatic form in Fig. 11. The machine comprises a standard 29 integral with a base 30. A crank member 31 is mounted on the standard 29 and operates a reciprocating plunger 32 mounted in guideways 33 on the standard. The plunger contains a supply of staples 28 which are impressed into the material passing between the plunger and the

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base. A stapling machine of the type illustrated in Fig. 11 may be used for performing the operations at station A.

A cutting and scoring machine is illustrated in simplified diagrammatic form in Fig. 12. The machine comprises a pair of cylinders 33 and 34 mounted on shafts 35 and 36. Cylinder 33 is provided with two scoring knives 37 cooperating with corresponding indentations 37' in a corresponding cylinder 34. The cylinder 33 further carries a cut-off knife 38 cooperating with the corresponding depression 38' in the cooperating cylinder 34.

A continuous band of material consisting of board 11 and strips 15 and 16 is fed between the rollers 33 and 34. Two successive score lines 17 and 18 are impressed in the band which is then separated into individual blanks by the cut-off knife 38 thus forming individual blanks, each blank comprising two transversely extending score lines. Mechanism for folding and seam sealing is diagrammatically shown in Figs. 13 and 14. The flat blanks 19 are advanced along tracks 39 and 40 in the direction of the arrow 41. As the blanks are advanced, the ends of the blank are acted upon by sweeps 42 and 43 depressing the outermost portions of the blank and folding the blank along the score lines 17 and 18.

During the first part of the folding operation, during which the ends of the blank are folded to a position substantially normal with respect to the center portion of the blank, the sweeps 42 and 43 pass from a position above the tracks 39 and 40 to a position on either side of the tracks. Thereafter the folding operation is completed and the end portions of the blank folded into a position substantially parallel with the center portion of the blank by the sweeps 42 and 43 passing underneath the tracks 39 and 40. During this final folding stage the ends of the container blank overlap as shown in Figs. 2 and 3 at 24 and are then secured together by a stapling machine diagrammatically shown at 44. The blanks leaving the tracks 39 and 40 are ready for shipment to the user.

A form of device for performing the rim forming operation is shown in Fig. 15. The cylindrical blank 19''' is held on a collapsible and expandable mandrel so reinforcing and supporting the blank 19''' against the forces exerted upon it during the rim forming operation.

The rim forming tools proper may be two sets of rollers 45 and 46 bearing down on the rims 15 and 16 respectively. Rollers 45 are adjustably mounted on a cross shaft 47 on collars 48 provided with set screws 49 for adjustment for any required diameter. The cross shaft 47 is held on a vertical shaft 50 in a fitting 51, the vertical shaft 50 being adjustable in a vertical direction for movement towards the blank 19''' during the rim forming operation. In the event plastic edging is employed, heat may be applied during the rim forming operation to render the edging more readily formable.

The second set of rollers 46 is mounted on stub shafts 52 adjustably mounted in bosses 53 on a base 54 clamped in place by set screws 55.

A central support 56 has a central bore 57 through which a shaft 58 extends having on its ends right and left screw threads 59 and 60, respectively. The screw threads move pyramidal wedges 61 and 62 acting on inclined surfaces 63 of jaws 64 shown also in plan view in Figs. 16 and 17. The jaws, in turn, act on segments 65 having outside surfaces 66 corresponding in

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curvature to the inside surface of the blank 19'''. The jaws 64 are held against rotation relatively to the central support 56 by fins 67 on the support 56 engaging notches 68 in the jaws. Springs 69 between the jaws tend to contract the elements of the mandrel against the action of the wedges 61 and 62.

In the operation of the device an expanded blank is placed on the collapsed mandrel whose elements have the relative position shown in Fig. 17. The mandrel is then expanded by turning the shaft 58 until it completely supports the wall of the blank.

The inturning or forming of the edging strips 15 and 16 is accomplished by a rotation of the rollers 45 and 46 with regard to the mandrel carrying the blank, or vice versa. During the crimping the rollers 45 are advanced vertically towards the blank until the strips have been inturned or crimped to the desired degree. During the forming of the strip 16 the blank also moves slightly towards the central support 56, sufficient vertical clearance for this movement being provided between the fins 69 and the corresponding notches 68.

After the edge forming operation the mandrel 20 is contracted to the position shown in Fig. 17 to permit its removal through the inturned rims 15 and 16. The crimped blank 19''' is then ready for insertion of a flat bottom disk 21 which is supported on the L-shaped rim 15 and completes the container body.

The inturning of the rims 15 and 16 considerably stiffens the container against deformation in transport or in the course of its ordinary use.

The containers produced by my novel method are not only pleasing in appearance but extremely economical to manufacture and to set up. The machinery required at the several stations A to H is simple of construction and easy to operate.

The equipment for making collapsed blanks, stations A to C, is capable of continuous high speed operation, a particular feature being the use of rolls of material in distinction from the use of individual sheets.

The setting up of containers 19''', 21 from collapsed blanks may be done at the merchandise manufacturer's plant with relatively simple equipment. One crimping or forming machine due to its adjustability suffices for forming edging of blanks of a considerable range of diameters.

Obviously the present invention is not restricted to the particular example herein described and illustrated. Various modifications may be made in the sequence of operations. For example cut and unscored blanks may be subsequently scored on a separate scoring machine.

Changes may also be made in the specific blank structure. While I have shown and described a one ply blank in which edging is attached to one ply of board, it is obviously possible to laminate a second ply of board over the first, so as to place the edging between the two plies with only the portion of the edging extending beyond the outer edge of the blank showing. Instead of an overlap at the seam of the blank, the ends may be formed into a butt joint which may then be sealed with a strip of material. Other forms of machines may be substituted for the ones described without essentially changing my method of making, erecting or completing containers. All such changes, as well as additions, omissions, or a rearrangement in the order of operations

manifestly do not constitute a departure from the spirit and teaching of this invention.

What is claimed is:

1. The method of forming containers which consists in providing a flat collapsed tubular container wall of foldable board having attached to at least one end flat reinforcing edging extending beyond the edge of said wall; expanding said collapsed wall to form a hollow structure; in-turning said edging to form an inwardly extending stiffening ledge fixing the shape of the container; and inserting an end wall disk into said hollow structure so as to rest on said ledge.

2. The method of forming containers which consists in providing a continuous band of non-metallic foldable material and a continuous strip of reinforcing edging; attaching said strip to said band so as to extend beyond one side edge of said band; scoring said band transversely of the band and cutting said band and attached strip into individual blanks, each blank comprising two score lines; folding each of said blanks along said score lines to form a flat tubular sleeve, the ends of each blank forming a seam portion; securing together the ends of the tubular sleeve at said seam portion; expanding said flat tubular sleeves to form hollow structures, in-turning said edging to form an inwardly extending stiffening ledge; and inserting an end wall disk into said hollow structure so as to rest on said ledge.

3. In the method of forming collapsible containers of cardboard, paperboard and the like the steps comprising, providing a continuous band of foldable board and a continuous strip of edging; attaching said strip to said band so as to extend beyond one side edge of said band; cutting and scoring said band transversely of said band to form individual blanks, each blank comprising two score lines; folding said blank along said score lines to form a flat tubular sleeve, the ends of said blank forming a seam portion; and securing together the ends of said tubular sleeve at said seam portion.

4. The method of forming a container which consists in providing a flat collapsed tubular container wall of foldable board having attached to both ends strips of edging extending beyond the edge of said wall; expanding said collapsed wall to form a hollow structure; in-turning said edging to form inwardly extending flanges stiffening said wall and resisting collapsing of said wall; and inserting an end wall disk into said cylinder so as to rest on one of said flanges.

5. The method of forming containers which consists in providing a continuous band of non-metallic foldable material and two continuous strips of edging; securing said strips to said band so as to extend beyond either side edge of said band; cutting and scoring said band transversely of the band to form individual blanks, each blank comprising two score lines; folding each of said blanks along said score lines to form a flat tubular sleeve, the ends of each blank forming seam portions; securing together the ends of said tubular sleeve at said seam portion; expanding said tubular sleeves to form hollow structures; in-turning strips of edging to form inwardly extending projections stiffening the expanded hollow structure; and inserting an end

wall disk into said hollow structure so as to rest on one of said projections.

6. In the method of forming collapsible containers of cardboard, paperboard and the like, the steps comprising, providing a continuous band of foldable board, providing two continuous strips of edging; attaching said strips to the edge portion of said band so as to extend beyond the side edges of said band; cutting and scoring said band transversely of the band and the attached strips to form individual blanks, each blank comprising two score lines; folding said blanks along said score lines to form flat tubular sleeves, the ends of each blank lying in seam forming relation; and securing together the ends of said blank to form a seam.

7. The method of forming a container which consists in providing a flat collapsed tubular container wall of foldable board having attached to both ends strips of edging extending beyond the edge of said wall; expanding said collapsed wall to form a hollow structure; in-turning one of said strips to form an inwardly extending flange substantially of L-shaped cross section and in-turning the other strip to form an inwardly extending ledge of substantially J-shaped cross section; and inserting a bottom end wall disk into said cylinder so as to rest on said L-shaped flange.

8. A collapsed flat container blank comprising a substantially rectangular cardboard panel having two transverse score lines and two flat bands of edging attached to the side edge portions of the panel so as to project beyond the side edges of the blank, the blank being folded upon itself along said score lines, the ends of the panel and bands being overlapped and secured together to form a tubular structure adapted to be expanded into cylindrical form.

9. In the method of forming a hollow container wall resistant to recollapsing from a collapsed flat tubular blank consisting of foldable board and having flat edging attached to the end portions of the blank, the steps which comprise; expanding said blank to form a hollow structure; and in-turning a portion of said edging so as to lie in a plane at a substantial angle with respect to the remainder of said edging, the inturned portion forming a stiffening rib on said edging resisting recollapse of said blank.

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