

May 21, 1940.

J. M. HOTHERSALL

2,201,177

FIBER CONTAINER MANUFACTURE

Filed Dec. 9, 1938

2 Sheets-Sheet 1

Fig 1

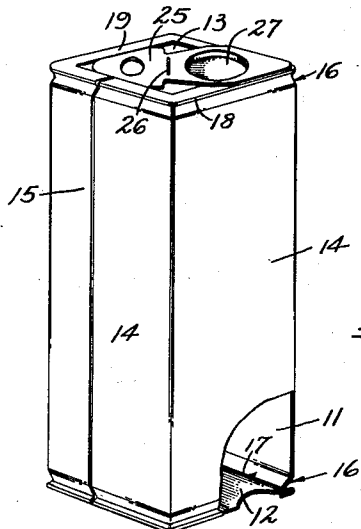


Fig 2

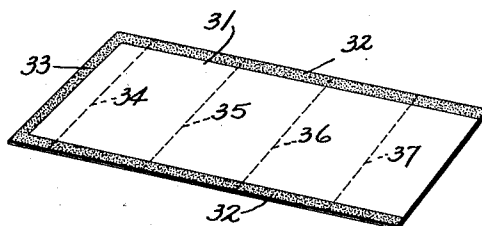


Fig 4

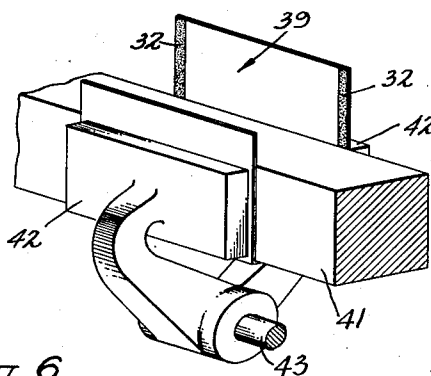


Fig 3

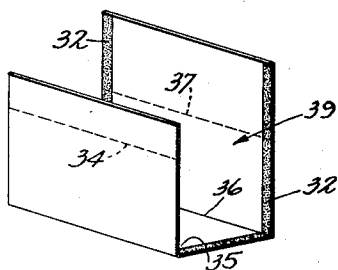


Fig 6

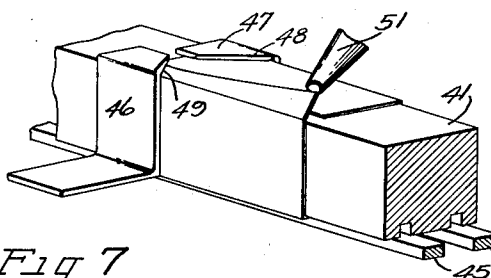


Fig 5

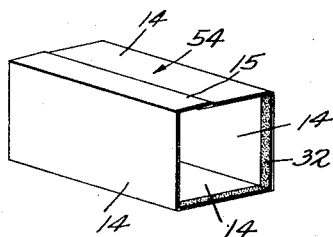
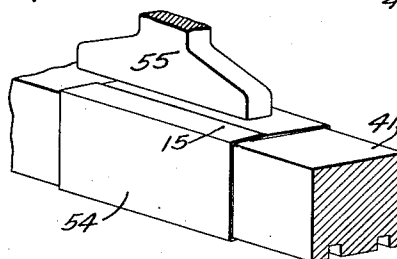


Fig 7



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2 Sheets-Sheet 2

Fig 8

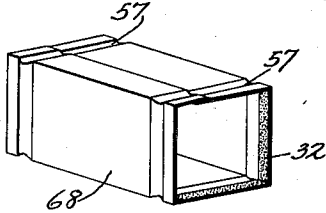


Fig 9

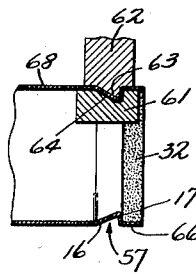


Fig 10

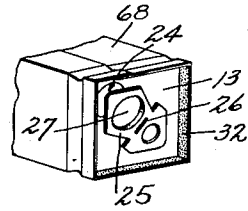


Fig 11

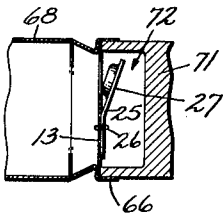


Fig 12

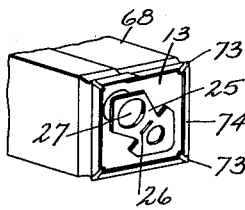


Fig 13

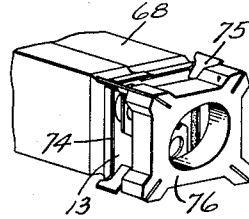


Fig 14

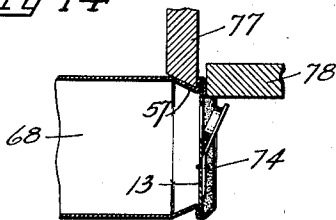


Fig 15

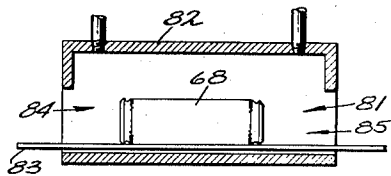
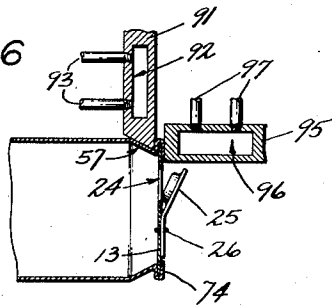


Fig 16



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## UNITED STATES PATENT OFFICE

2,201,177

## FIBER CONTAINER MANUFACTURE

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Application December 9, 1938, Serial No. 244,868

5 Claims. (Cl. 93—39.1)

The present invention relates to a method of preparing rectangular fiber containers and has particular reference to the forming of a fiber container having rigid supporting truss portions adjacent the ends of the body on which end members are disposed and held in a permanent joint.

The invention contemplates first the forming of a truss reenforced section in a tubular fiber body and into one or both ends of the body are then inserted either or both top and bottom end members. These are positioned in an exact relation to the truss portions of the body so as to produce the maximum strength and rigidity for the container when the adjacent body portions are shaped around the edges of the end members and after these are fully sealed in a permanent junction which accentuates the supporting truss effect.

The invention is directed to an improved process of producing rectangular fiber containers having rigid supporting truss portions such as are embodied in the container shown in either of my two Patents 2,085,979 and 2,089,958, issued respectively on July 6, 1937, and August 17, 1937, and each covering "Containers."

An object of the present invention is the provision of a method of manufacture of rectangular fiber containers which provides a tubular body having supporting truss portions formed in the body wall adjacent one or both ends and on these supporting sections a top or bottom end or both are firmly secured in tight adhesively-secured joints which are of a construction to cooperate with the truss portions to provide a rigid supporting truss effect at the end of the container.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a perspective view of a reenforced fiber container of supporting truss construction made in accordance with the steps of the present invention;

Fig. 2 is a perspective view of a blank from which the container of Fig. 1 may be made;

Fig. 3 is a perspective view of a partially bent blank illustrating the first step in the present method of manufacture;

Fig. 4 is a perspective view of the blank of

Fig. 3 with the addition of some mechanism capable of producing the partially bent shape;

Fig. 5 is a perspective view of the tubular body formed from the blank of Fig. 2;

Figs. 6 and 7 are perspective views of intermediate stages of manufacture in producing the body of Fig. 5, these views also showing some of the principal parts of the mechanism required;

Fig. 8 is a perspective view of the tubular body after truss portions have been partially formed adjacent the two ends of the body;

Fig. 9 is a sectional, fragmentary view showing one end of such a body with its truss portion and also showing parts of a beading mechanism for effecting this step in the process;

Fig. 10 is a perspective view of the top end of the tubular body with its top end member in inserted position and resting on the truss section;

Fig. 11 is a fragmentary sectional view of the container parts shown in Fig. 10 and also showing the principal element of an inserting mechanism;

Fig. 12 is a view similar to Fig. 10 and showing the corners of the body tucked-in over the top member;

Fig. 13 is a perspective view illustrating this corner tucking operation;

Fig. 14 is a fragmentary sectional view of one end of the container and showing mechanism for bending and reshaping parts of the body wall;

Fig. 15 is a schematic sectional view on a smaller scale of a heating oven showing a partially completed container passing therethrough; and

Fig. 16 is a sectional view similar to Fig. 14 and showing parts of squeezing mechanism for completing the truss reenforced end joint.

The present invention is directed to a series of steps in the manufacture of rectangular fiber container and Fig. 1 illustrates by way of example a fiber can structure which may be the result of a fulfillment of such method steps. The container consists primarily of a rectangular body 11 and bottom and top closures or end members 12 and 13.

The can body consists of four side walls 14 having right angled corners. One of the side walls consists of two parts which are joined together by a suitable adhesive in a side seam 15. The bottom 12 and the top 13 each consists of a disc of fiber material the edges of which are interlocked with the adjacent end of the body and held by adhesive.

A section of the can body is bent obliquely inwardly at 16 adjacent the body end to form a

supporting element for the can end and this also produces an inwardly inclined reinforcing truss at that part of the container. This body wall is thence bent outwardly in a relatively sharp corner to provide a horizontally outwardly extending ledge 17 on which the can end rests. This sharply bent ledge 17 cooperates with the inwardly inclined truss portion 16 to constitute a rigid non-collapsible structure which resists outward and inward movement of the body wall and insures against vertical collapse due to any longitudinal strains at the ends or axially of the container.

The top or upper end closure 13 is seated upon the ledge 17 and the extreme edge of the body is then folded down at 18 to provide a horizontally extending body part or terminal portion 19 above or outside the end closure. The bottom or lower end closure 12 is similarly seated and held. An empty container having both ends closed (Fig. 1) is the result desired from the sequence of operations of the present invention.

Such a container obviously must be opened prior to filling with its contents and later the contents will be sealed until such time as the filled container will be opened for dispensing of the contents. My patents mentioned above explain some of the uses of such a container.

The top member 13 is formed with a filling and discharge opening 24 (Figs. 10 and 16) which is located near one corner of the top. A fibrous auxiliary closure member 25 is also provided and is located exteriorly of the top closure 13. The center portion of this auxiliary member is secured to the top in any suitable manner as by a staple 26. One end section of the auxiliary closure extends over the discharge opening 24 of the top closure and is formed with a drawn plug section 27 which is adapted to fit in and close the discharge opening both prior to filling with contents and after filling up to the time of dispensing of the contents. The detailed steps for producing the empty container of Fig. 1 will now be given.

For the rectangular shape of Fig. 1 a rectangular body blank 31 (Fig. 2) is provided and a suitable adhesive such as a thermoplastic cement or a remoistening glue may be applied to certain desired portions of the blank. The kind of adhesive used and the manner of application forms no part of the present invention.

For the particular container under consideration two strips of adhesive 32 will be applied along the two long edges of the blank 31 and a connecting strip 33 will be applied along one short edge. In the present embodiment all of the cement will be on only one surface of the blank.

To assist in subsequent bending and forming of the blank into its tubular shape crease lines 34, 35, 36 and 37 may be pressed in as shown in Fig. 2, all of these lines being parallel to the short end edges of the blank. The spacing and location of such crease lines will be determined by the size and shape of the desired body.

Beginning with such a blank 31 the first step of the present method is the bending of the blank along the crease lines 35, 36 so that the U-shape of Fig. 3 results. This partially formed blank will be indicated by the numeral 39. The bent corners are then right angle corners as shown.

This operation may be brought about by the cooperation of a forming mandrel or horn 41

(Fig. 4), over which the blank is bent, and forming wings 42 which do the bending.

Such forming wings may be hinged on a shaft 43 located below the horn, the two wings being brought up simultaneously against the under side of the blank.

The wings 42 swing the blank walls over against the side walls of the horn 41, the blank being thus bent along the crease lines 35 and 36 into the partially formed blank 39 as described. The wings 42 are shown at the end of the bending stroke in Fig. 4 and in such position the side walls of the U-form of blank 39 are held tightly pressed against the side walls of the horn. The surface containing the adhesive strips 32, 33 is on the inside.

Fig. 6 shows the next step in the operation at which time a further bending of the blank takes place, this time along the crease lines 34, 37. At the same time the adhesive is rendered tacky. Where a thermoplastic cement is used, hot air for example, may be projected against the strip 33 as the short end of the blank is being bent over. If a remoistening glue constitutes the adhesive, water vapor, steam or the like is projected against the strip 33 as the bending proceeds.

The U-shaped partially bent blank 39 while still on the horn 41 is moved longitudinally thereof for this combined bending and adhesive conditioning step. Such longitudinal movement may be performed by a blank and can body feeding device 45 (Fig. 6) actuated in a suitable manner.

Stationary forming plates 46, 47 are held in spaced position on either side of the horn 41 and as the U-shaped blank 39 advances along the horn under the action of the feeding device 45, the sides of the blank between crease lines 34, 35 and between 36, 37 pass between the plates 46, 47 and the horn 41. In doing this the long side of the blank 39 above the crease line 37, engages against an inclined edge 48 of the plate 47 and as the blank continues to advance this part of the blank is moved down as the wall bends along the crease-line. When the blank has moved under the plate 47, this section beyond the crease line lies flat on the top of the horn 41, as in Fig. 6.

Just after the long side or blank section beyond the crease line 37 starts to bend down, the short side of the blank, that is the section beyond or outwardly from the crease line 34, engages against an inclined edge 49 of the plate 46 and this section begins its bending at the crease-line 34. As the blank moves into the plate 46, the short section is laid down over the long section of the blank already down on the horn.

The effect of this difference in timing for bending first along the crease-line 37 and thence along the crease-line 34, is to leave the short side spaced above the long side for a moment while the blank advances between the forming plates 46, 47. While the short side is thus slightly elevated above the long side the adhesive strip 33 on the edge of the short side passes along a nozzle 51 which is held in a stationary position. Hot air is projected from the nozzle 51 and this impinges against the adhesive strip 33 and renders the same moist or tacky. By the time the blank has moved through the plates 46, 47, the edge of the short strip containing the adhesive strip 33 has been brought down against the long side of the blank.

If a remoistening glue is used, steam or water vapor will pass from the nozzle 51 against the

adhesive strip 33 instead of the hot air previously mentioned.

The blank is now a tubular body shape (now designated by the numeral 54) and with its overlapped edges in the position shown in Fig. 5. This body may be further advanced along the horn and brought into a bumping station shown in Fig. 7. The overlapped edges of the wall sections with the tacky adhesive 33 interposed therebetween is now positioned under a pressure hammer 55. Hammer 55 presses down upon the overlapped parts holding these parts for a moment against the horn. This operation takes only a moment and the tacky cement quickly sets so that when the hammer 55 is raised the side seam 15 is complete.

In the next operation the ends of the tubular body 54 are subjected to a beading operation as a preliminary part of the forming of a truss portion. This preliminary action is for the purpose of obtaining the oblique body wall part 16. A bead 57 (Fig. 8) is pressed into an end of the tubular body 54 by a beading mechanism the principal parts of which are indicated in Fig. 9.

Each side of the body may be progressively subjected to a beading operation or the four sides may be beaded at the same time. To effect such beading a grooved anvil die 61 is positioned inside of the tubular body and a cooperating outside squeezer jaw 62 is brought down against the outside of the body. The squeezer jaw 62 carries a beading ridge 63 which contacts the body wall and forces inwardly the engaged part of the wall forcing it into a groove 64 formed in the die 61. This draws the bead 57 in the body.

It will be observed by reference to Fig. 9 that this bead 57 includes the ledge 17 which is bent at right angles at the inner line of the adhesive strip 32 on the end of the body and on the inside, leaving an outwardly and axially extending flange 66. This straight wall or ledge is bent outwardly in a sharp corner where it merges into the obliquely disposed truss wall 16. A beaded can body 68 (Figs. 8 and 9) is the result of these operations.

The next step in the instant method is the insertion of a can end member into the beaded end of the body 68. In Fig. 10 there is disclosed the top member 13 in its position within the flanged end of the body and resting upon the ledge 17 of the bead 57. The insertion of the bottom end 12 is accomplished in exactly the same manner and the relative position of the ends, bottom and top, within the body, is the same. Fig. 11 illustrates the insertion of the top end and it will be understood that the bottom end is inserted in exactly the same way.

An inserting head 71, having a recess 72, is moved toward the ledge 17 and carries before it a can end for the inserting operation. The recess 72 forms a clearance for the fibrous auxiliary closure member 25. At the time that the can top member 13 is being inserted into the end of the can body 68 the plug closure section 27 is partially open as it extends out at a slight angle as clearly illustrated in Fig. 11.

After a can end has been inserted into the container body 68 the extending flange 66 is tucked in at its four corners as at 73 (Fig. 12). This tucking in of the flange parts draws over these parts into slightly angular shape to produce reformed necked-in flange wall sections 74.

Fig. 13 illustrates this corner tucking operation. Tucking blades 75 are carried on the forward end of a cross head 76 which is moved toward the end

of the can body 68 and in this movement the blades strike against the corners of the extending flange section 66 and force down the fiber stock at the corners to produce the tucked-in corners 73 and the drawn-in flanges 74.

Fig. 14 illustrates the next operation wherein the bead 57 is engaged by an anvil die member 77 and while so engaged the drawn or necked-in flange parts 74 are struck by a pressure head member 78. This is shown as applied to one side of the can end but it will be understood that all sides of the end are operated on. This forces the drawn-in flange parts down against the inserted top end, the adhesive strip 32 being interposed between the outer surface of the top end and the inside of the flange part 74. This is only a momentary pressing and creasing action and after the parts 77, 78 are removed from the can, the flange section 74 springs back as illustrated in the lower part of the body shown in Fig. 14.

The adhesive 32 on the inside of the inclined flanges 74 is next heated to render the adhesive tacky. As exemplary of this step Fig. 15 shows the body 68 with its inserted ends passing through a heating chamber 81 which may be enclosed within a housing 82. The bodies may be conveniently carried through the chamber on a belt 83, passing in by way of an entrance opening 84. After heating, the containers pass out through a discharge or exit opening 85. Obviously the adhesive 32 could be heated locally but in any event the result of this operation is to make the adhesive sections 32 tacky.

The final operation upon the can body to completely form the reenforcing truss sections 16 and close the end joints of the body is graphically illustrated in Fig. 16, where one side of the container is being sealed. It will be understood that all sides are likewise treated to form the completed container.

An anvil die member 91 is used to back up the parts and for this purpose a projecting tapered edge of the member is inserted within the groove 57. This member 91 is preferably cooled as by circulation of a cooling medium through a channel 92 formed in the member, circulation being obtained by means of pipes 93 in any well known manner. Cold water provides a convenient cooling medium for this purpose.

It will be observed by comparing Figs. 14 and 16 that the cooling member 91 assumes the same position as that formerly occupied by the anvil 77 in a preceding operation. A clinching and sealing pressure head 95 is now used in cooperation with the anvil 91 to again press down the flange parts 74. This time since the adhesive in the strip 32 is in a tacky condition, the flange parts when pressed down against the top of the container remain in that position, sticking or adhesively securing the parts fast together.

The pressure head 95 assumes the same position as that formerly occupied by the head 78 (Fig. 14) but in the case of the head 95 it is maintained cool by circulation of a suitable cooling medium within the head.

For this purpose the head 95 is formed with a chamber 96 through which water or other cooling medium may be circulated by way of pipes 97. At the time, therefore, of the final pressing of the body flange down on the edge of the end member the adhesive is immediately set by these cooled operating parts. A final sealed joint is the result, this providing the inclined truss portion 16, its supporting ledge 17, and the folded down or inwardly extending peripheral flange of

the body 18, as previously described in connection with Fig. 1.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the steps of the process described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the process hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. The method of preparing fiber containers which comprises shaping a fiber blank having cement edge strips on one surface into a tubular can body with said cement strips on the inside, forming a side seam on said body by treating an intermediate cement strip between overlapping edges of the blank and by pressing said edges together, inwardly beading an end of said can body to produce inwardly extending rigid supporting truss portions adjacent said cement strip edges each merging into an intermediate outwardly extending ledge portion terminating in an axially extending flange, inserting a flat can end into the beaded end of said body and against said ledge portions, and forming an end seam between the can body and said can end by first treating said interposed cement strips and then folding inwardly and tightly squeezing said axially extending flanges over the outer periphery of said seated flat can end to lie flat thereagainst while setting said interposed cement to provide a container having its body wall braced against inward and outward movement.

2. The method of preparing rectangular fiber containers which comprises bending a fiber blank having thermoplastic cement edge strips on one surface into a tubular can body with said cement strips on the inside, said body being square in cross section, forming a side seam on said body by heating an intermediate cement strip between overlapping edges of the blank and by pressing said edges together, inwardly beading both ends of said can body to produce inwardly extending rigid supporting truss portions adjacent said cement strip edges, each truss portion merging into an intermediate outwardly extending ledge portion terminating in an axially extending flange, inserting flat square can ends into said body and against said truss and ledge portions, and forming end seams between the can body and can ends by first heating said interposed cement strips and then folding inwardly and tightly squeezing said axially extending flanges over the outer periphery of each seated flat can end to lie flat thereagainst while setting said interposed cement to brace the body wall against inward and outward movement.

3. The method of preparing rectangular fiber containers which comprises providing a fiber blank having thermoplastic cement strips on a surface thereof adjacent certain of its edges, bending said blank into U-shape with two square corners and with said cement strips on the inside, further bending the legs of said U-shape blank into two right angled corners the while bringing the ends of said blank into overlapping spaced relation with a cement strip therebetween, heating said interposed cement strip to render it tacky, pressing together said overlapped blank ends in a side seam thereby producing a tubular can body with cement strips extending along an end thereof, beading inwardly the end of said

body adjacent said cement strips to produce rigid supporting truss portions, each merging into an intermediate outwardly extending ledge portion terminating in an axially extending flange, and leaving a cement lined portion at the end of said flange, inserting a flat end member inside of said flanges and seating it on said beaded truss and ledge portions, heating the cement on said body flanges to render it tacky, and sealing said end member in said body by folding inwardly and squeezing said flanges tightly against the interposed edges of said flat end member to lie flat thereagainst, said truss portions reinforcing the body wall against inward and outward movement.

4. The method of preparing rectangular fiber containers which comprises providing a fiber blank having thermoplastic cement strips on a surface thereof adjacent its two longitudinal edges and one of its transverse edges, bending said blank into U-shape with two square corners and with said cement strips on the inside, further bending the legs of said U-shape blank into two right angled corners the while bringing the ends of said blank into overlapping spaced relation with its transverse cement strip therebetween, heating said interposed cement strip to render it tacky, pressing together said overlapped blank ends in a side seam thereby producing a tubular can body with its longitudinal cement strips extending along both ends thereof, beading inwardly the ends of said body adjacent said cement strips to produce rigid supporting truss portions merging into intermediate outwardly extending ledge portions terminating in axially extending flange portions and leaving cement lined areas at the ends of said flange portions, inserting flat end members inside of said flanges and seating the same on said beaded truss and ledge portions, heating the cement on said body end flange portions to render the same tacky, and sealing said end members in said body by folding inwardly and tightly squeezing said flange portions against the interposed peripheral edges of said end flat members to lie flat thereagainst and to cooperate with said truss portions to brace the body wall against inward and outward movement.

5. The method of preparing rectangular fiber containers which comprises providing a fiber blank having thermoplastic cement strips on a surface thereof adjacent its two longitudinal edges and one of its transverse edges and also having crease lines extending transversely of the blank, bending said blank into U-shape along two of its crease lines with its cement strips inside, further bending the blank along other crease lines and into substantially tubular form but with the transverse cement strip edge slightly separated from the uncemented transverse edge, heating said transverse cement strip to render it tacky, squeezing the open edges together while the cement sets to form a tubular container body with the tacky cement surface therebetween thereby producing a side seam, beading inwardly the tubular body adjacent both ends to produce rigid supporting truss portions merging into intermediate outwardly extending ledge portions terminating in axially extending flange portions and with the longitudinal cement strips extending around the inside of the ends of said flange portions, inserting flat container ends in said beaded tubular body and seating the same against said truss and ledge portions, tucking-in the corners of the body by pressing the corners against the

inserted ends, pressing inwardly the said flange portions intermediate said tucked-in corners and bending the same down against said ends to lie flat thereagainst while creasing along the lines of bend and while supporting the body within its beaded truss portions, heating the cement on said flanges to render the same tacky, and finally sealing the ends within the said tubular body by pressing the said creased flange portions against the said flat ends with the tacky cement therebetween the while cooling the pressed parts to quickly set said cement and to complete the forming of a fiber container having its body wall braced against inward and outward movement.

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