June 20, 1961 W. L. GEIST 2,988,970

METHOD OF MAKING PAPER CAN BODY WITH TELESCOPIC SECTIONS

Filed May 27, 1959 3 Sheets-Sheet 1

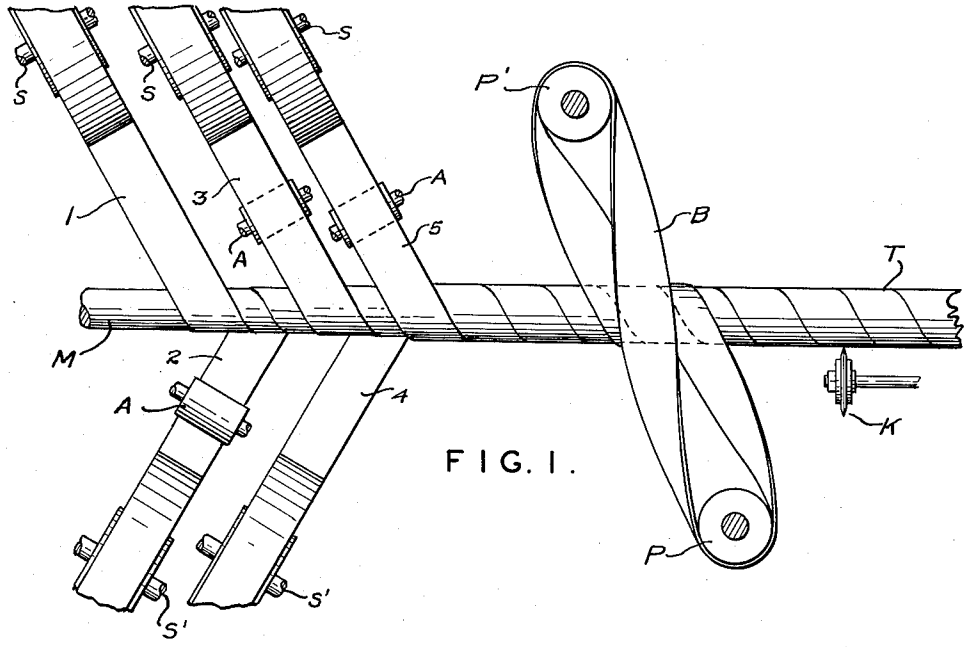


FIG. 1.

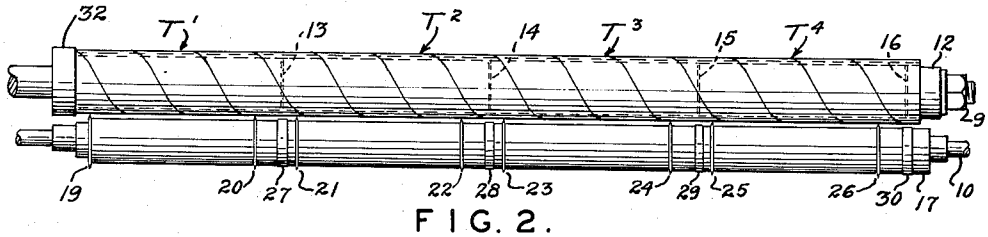


FIG. 2.

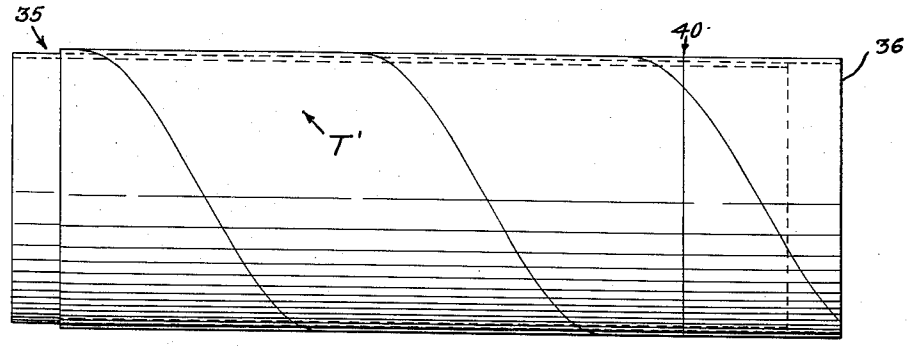


FIG. 3.

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METHOD OF MAKING PAPER CAN BODY WITH TELESCOPIC SECTIONS

Filed May 27, 1959 3 Sheets-Sheet 2

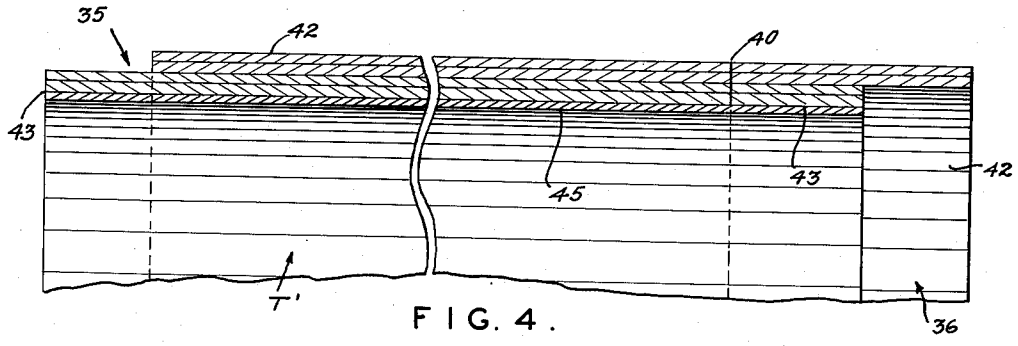


FIG. 4.

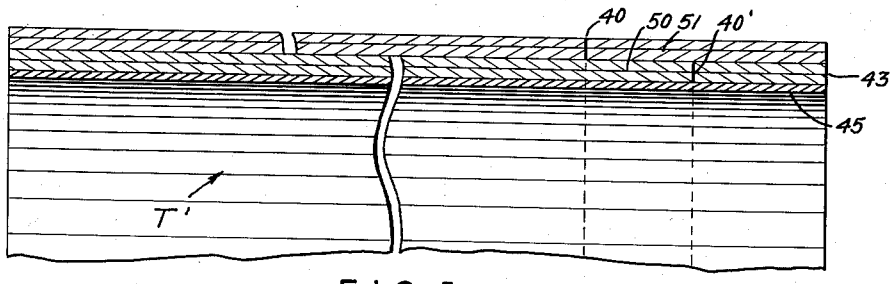


FIG. 5.

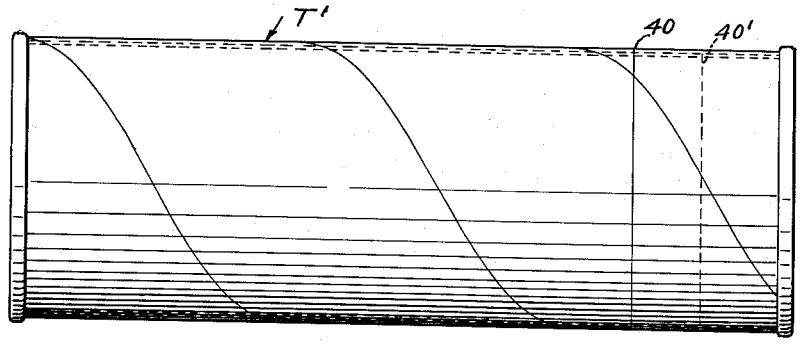


FIG. 6.

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June 20, 1961 W. L. GEIST 2,988,970

METHOD OF MAKING PAPER CAN BODY WITH TELESCOPIC SECTIONS

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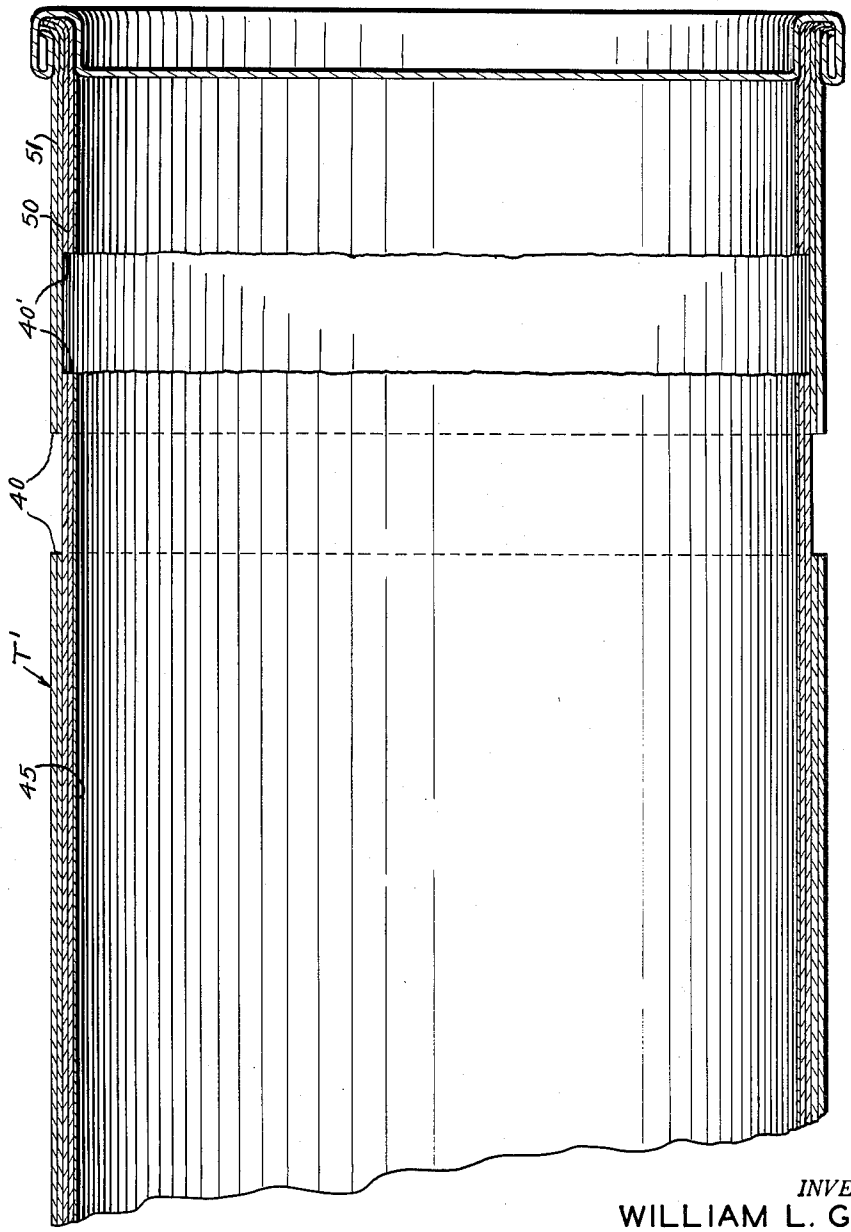


FIG. 7.

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METHOD OF MAKING PAPER CAN BODY WITH TELESCOPIC SECTIONS

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7 Claims. (Cl. 93—94)

This invention relates to the art of paper can manufacture, and more specifically to a method applicable to the manufacture of a new kind of multi-ply paper tube for a can body. The method hereinafter described forms a can body with separable telescopic sections adapted by its construction to be closed by metal ends or the like which are, in turn, secured to all of the plies of the container to form a leakproof joint therewith. By the use of this method it is possible to construct a can body of multi-ply paper wherein one of the layers, preferably the liner, remains completely intact, so that, when the container ends form the can, the liner and the can ends form a complete imperforate container of novel construction which can be, by a twist, separated intermediate its length for access to its contents.

The invention is illustrated and hereinafter described as applied to a can body formed by spirally wound plies of paper, but it should be clearly understood that the manner of forming the can body by spirally wound tapes is the preferred manner of making the invention, which results in a product with an imperforate liner.

To my knowledge, there are no known inexpensive methods of producing a can of the type above described wherein a telescopic can body is formed with an imperforate liner and in which the can ends may be applied and secured to all of the plies of a container, including the imperforate liner, so as to form a hermetically sealed container. By way of example, the construction of such a container by known methods and procedures would require, broadly, the following steps:

(1) Wind an outer tube over one size of mandrel and an inner tube over a smaller mandrel to obtain two tubes which can be assembled telescopically.

(2) Cut the outer tube midway its length into two sections.

(3) Repeat this cutting operation on the inner tube.

(4) Assemble one outer tube section over an inner tube section.

(5) Assemble the other outer and inner tube sections.

(6) Assemble the two body sections into a tube.

(7) Insert a continuous liner from end to end of the tube.

(8) Secure the two body sections against separation, such as by applying a label.

(9) Crimp on the end covers.

The structure of the instant invention can be performed by a minimum of manufacturing steps, such as:

(1) Winding successive plies of paper tape on a conventional mandrel in a conventional winding machine to form a liner, an inner tube, and an outer tube in superimposed relation, all in a single operational step.

(2) Cutting the completed tube on three spaced lines lengthwise to sever the tube circumferentially, but only partially radially. Two of these cuts are made from the outside in, and one is from the inside out, in a manner so that the outer cuts straddle the inner cuts; one of the outer cuts severs or perforates through the outer and inner plies to the liner; one of the outer cuts severs or perforates through the outer tube to the inner two plies of the inner tube; and the inner cut severs the liner and the inner two plies of the inner tube.

(3) The tube, after being so cut at intervals along its length, is then separated into sections at the line along

the cut through the outer tube from the outside, and at the cut through the inner tube and liner performed by the inner knife, by slipping apart the telescoping section between these cuts. Each separate section forms a body for a single can, therefore, and, when so separated, each body has stepped ends and is cut between its ends through the outer and inner tubes to the liner.

(4) The last step is one which eliminates the stepped ends on opposite ends of the tube by sliding the inner and outer tubes relative to one another into alignment. This forms a complete can body with an imperforate liner and cuts in the outer and inner tubes spaced lengthwise of the body to form a telescopic section therein, one end being the body and the other end the cover.

The instant invention is therefore based upon a distinctly new concept in manufacture which eliminates half of the previous steps involved, and, furthermore, any manual operations which were heretofore necessary. This method can be carried out in different types of machinery operating in distinctly different ways, but in the preferred method at least five plies of paper are successively wound spirally on the mandrel of a conventional winding machine to form a continuous tube. In the winding operation, the second and fourth plies and the outside of the liner are coated with adhesive. No adhesive is placed between the plies forming the outer tube and the plies forming the inner tube. This method forms a continuous tube which can be cut by a flying rotary knife or saw into lengths equal to two or more cans. Each of these separated lengths of tubing is then placed upon a suitable mandrel having opposed cooperating knives arranged in the manner above described, which slit or perforate to form the consecutive cuts from the outside through the four outer plies, from the inside through the liner and the two inner plies, and from the outside through the two outer plies, at spaced locations along the length of the tube.

When the can bodies are spirally formed, it is usually necessary to have two or more plies of paper for both the inner tube and the outer tube in order to hold each wall together, or it is necessary to have a single ply for each tube with overlapped edges glued in order to hold together. The type with overlapping joint would normally have the disadvantage of an offset surface where it is overlapped. However, this would not interfere with the construction and practice of the method. In the winding operation, the outermost layer may be a printed label to add finish to the container.

After the final step of the method in which the outer and inner tubes are brought into a condition with their ends in a single plane, a metal end is spun onto the open end of the body of the tube, and in the spinning operation it is usually desirable to have the metal cover tightly crimped into sealing relation with all of the plies of the tube in order to give the necessary strength and, of course, to provide a hermetic seal with the liner of the tube. This method and manner of manufacture accomplishes this desirable feature. The can with one metal end is usually shipped to the packager, who fills the body of the container and applies the opposite metal end in the same manner as the first. The filled container is very strong, due to the fact that the liner is imperforate from one end to the other. It will therefore withstand considerable internal pressure without damage or seepage of any kind, thus protecting the contents against contamination.

The user or purchaser simply twists opposite ends of the tube forming the can body, one end with respect to the other, which separates the tube to form a telescopic cover. This makes a convenient form of container which may be reclosed, but cannot be resealed, and is thus very attractive to certain users. Because it cannot be resealed, it is a non-refillable container.

Further objects and advantages will appear from the following detailed description and accompanying illustrations, in which:

FIG. 1 is a schematic view illustrating the manner of operation and arrangement of parts in the conventional tube winding machine so set up as to wind a tube with a liner and duel inner plies for the inner tube, and dual outer plies for the outer tube;

FIG. 2 is a schematic illustration of a cutter mechanism suitable for making the appropriate cuts along the length of the tube to form the telescopic container according to the method;

FIG. 3 is an illustration on an enlarged scale of a section of the tube after it leaves the cutters in FIG. 2;

FIG. 4 is a further enlarged sectional view of the tube shown in FIG. 3;

FIG. 5 is an enlarged sectional view showing the tube, such as in FIG. 4, after the inner and outer tubes have been slipped, relative to one another, so that their ends are in the same plane;

FIG. 6 is a view illustrating the complete body of the can; and

FIG. 7 is a view illustrating a completed telescopic cover separated from the body of the can.

Referring now to FIG. 1, illustrating a spiral tube winding machine, this figure shows a horizontal mandrel M about which the tapes are spirally wound to form the tube. This machine also includes a driving belt mechanism B, which is a twisted belt, one run of which is looped about the mandrel for rotating the paper tube and causing it to traverse the length of the mandrel. Adjustment of the pulleys P and P^1 determine the spiral lead so that the edges of the paper tapes preferably are in abutment. A traveling knife K severs the tube at intervals to form three or four can bodies so as to facilitate subsequent handling. The first step is preferably performed in this machine. The apparatus also includes a multiplicity of parallel supports for rolls of paper tape, some on one side and some on the other. These supports are indicated as S and S^1. In this particular case there are five rolls of tape used. Tape **1** forms the liner for the tube. Tapes **2** and **3** form the inner tube, and tapes **4** and **5** the outer tube. The adhesive rollers, indicated as A, operate to coat the inner side of tapes **2**, **3** and **5**, so that tapes **1**, **2** and **3** are adhesively secured together to form the inner tube, and tapes **4** and **5** are adhesively secured together to form the outer tube. No adhesive is applied between tape **4** and tape **3**, since it is desirable in the process to slide the inner tube relative to the outer tube as one of the steps in forming the telescopic can.

As the tapes are passed between the belt B and the mandrel M, the belt B grips the outer surface of the paper tube and causes it to rotate, as well as traverse the mandrel M lengthwise in a direction from left to right, as viewed in FIG. 1. The flying knife K severs the tube beyond the belt B into individual tubes which are approximately the length of four cans, and this, in turn, is wholly arbitrary and the length selected is merely for convenience in subsequent handling.

The second step is preferably performed in the machine shown in FIG. 2, which comprises a pair of shafts **9** and **10**, the former of which is preferably driven by some power means, and the latter of which is mounted for movement toward and away from the shaft **9**. On shaft **9** is a roller **12** secured thereon against rotation and mounting a plurality of cutting knives **13**, **14**, and **15**. These may be disk knives mounted between sections of the roller **12**.

The shaft **10** carries a sectional roller **17** mounting a plurality of spaced knives **19**, **20**, **21**, **22**, **23**, **24**, **25**, and **26**. Between the knives **20** and **21**, and located opposite the knife **13**, is a backing-up roll **27** of enlarged diameter relative to the roller **17**. Similar backing rolls **28**, **29**, and **30** are mounted opposite the knives **14**, **15**, and **16**, respectively.

The spirally wound tubes such as T are severed by the knives K, and are then separately placed upon the mechanism shown in FIG. 2 to perform the cutting operation. During this operation, shafts **9** and **10** and rolls **12** and **17** are separated, and the tube T is slid onto the roller **12** until one end thereof abuts the collar **32**, so that the tube T snugly fits on the roller **12** and is rotated therewith. Roller **17** and the knives mounted thereon are then brought firmly into engagement with the surface of the tube T so that the roller **17** engages the tube T and forms a limit for the cutting operation performed by the several knives, both on roller **12** and on roller **17**. The several knives, in turn, are of a diameter which will penetrate the paper of the tube T in the following manner: Knife **19** severs the outer tube comprising the spirally wound strips **4** and **5**; knife **20**, on the other hand, is of a diameter sufficient to cut through both the outer and inner tube to the liner formed by the spirally wound strip **1**; knife **13** is of a diameter to cut through the liner and the inner tube out to the outer tube formed by the spirally wound tapes **4** and **5**, and knife **21** is of a diameter sufficient to cut through the tapes **4** and **5** forming the outer tube. The rollers **17** and **12** are then separated and the tube T removed. The outer section of the end of the tube T severed by the knife **19** is discarded, and this leaves individual tubes telescopically engaged, which may be separated into individual tubes T^1, T^2, T^3, and T^4.

FIGS. 3 through 5, inclusive, show one of these tubes T^1 when separated from the tube T. It will be realized that all of the tubes will be exactly alike, and that the cuts performed by the remaining knives form tubes T^2, T^3, and T^4, which are exactly like the tube T^1. As the tubes leave the machine illustrated in FIG. 2, therefore, and are subsequently separated, they appear as shown in FIG. 3 with one end thereof, such as **35**, stepped externally, and the opposite end, such as **36**, stepped internally. Intermediate the two ends is a score or cut **40** which extends through the outer tube and through the inner tube to the liner, but the liner remains unsevered except at the ends.

Each of thse tubes, such as T^1 is then placed in a machine which knocks the outer plies and inner plies into alignment so that the ends thereof are in a single plane, such as shown in FIG. 5, and this step, therefore, forms a completed body tube including an externally stepped body **50** and an internally stepped cover such as **51**. But the liner **45** is continuous from end to end of the tube T^1, and imperforate. When the metal or other kind of end is secured to the opposite ends of the tube T^1, the resulting structure is a complete can of great strength, since the cover can be secured to all of the plies on each end, and to an imperforate lining for holding the cover and the body of the can together. Obviously, a label can be placed over the outside of the continer for added strength.

In the knocking operation which brings the ends of the can into alignment, the cut **40** in the outer tube **42** becomes offset as at **40'** from the cut through the inner tube **43**, thus forming the telescopic connection between the can body and the cover.

FIGS. 6 and 7 indicate the completed can with the cover separated so as to illustrate the telscopic connection and the fact that the liner must be severed in order to disconnect the two sections of the tube to form a can and a cover.

A construction has been described which will fulfill all of the objects of the present invention, but it is contemplated that other modifications will be obvious to those skilled in the art which come within the scope of the invention as defined by the appended claims.

I claim:

1. The method of manufacturing a paper can body with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper, comprising the steps of making external and internal cir-

cumferential cuts at opposite ends of the tube for severing the inner ply from the tube at one end and the outer ply from the tube at the opposite end so that the severed plies, when separated from each end of the tube, form a paper tube with an internally stepped end and an externally stepped end, making a circumferential cut intermediate the length of the tube from the outside to the inner ply forming the liner, and then slipping the inner with respect to the outer plies to eliminate the stepped ends to form the paper can body with the telescoping section between the plies and an imperforate ply forming the liner.

2. The method of manufacturing a paper can body with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper, comprising the steps of making a circumferential cut intermediate the length of the tube from the outside to the inner ply forming the liner, making external and internal circumferential cuts at opposite ends of the tube for severing the inner ply from the tube at one end and the outer ply from the tube at the opposite end so that the severed plies, when separated from each end of the tube, form a tube with an internally stepped end and an externally stepped end, and then slipping the inner and outer plies with respect to one another to eliminate the stepped ends to form the paper can body with the telescoping section between some of the plies and an imperforate ply forming the liner.

3. The method of manufacturing a paper can body with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper, comprising the steps of making a circumferential cut intermediate the length of the tube from the outside to the inner ply forming the liner, simultaneously making external and internal circumferential cuts at opposite ends of the tube for severing the inner ply from the tube at one end and the outer ply from the tube at the opposite end so that the severed plies, when separated from each end of the tube, form a tube with an internally stepped end and an externally stepped end, and then slipping the inner and outer plies with respect to one another to eliminate the stepped ends to form the paper can body with the telescoping section between some of the plies and an imperforate ply forming the liner.

4. The method of manufacturing paper can bodies with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper, comprising the steps of making alternate external and internal circumferential cuts spaced along the length of the tube with the internal cuts severing the liner and an inner ply and the external cuts severing the paper from the outside to said inner ply, respectively, adjacent internal and adjacent external cuts being spaced substantially the length of a can body so that when said tube is separated along said circumferential cuts each tube section separated will have an internally stepped end and an externally stepped end, making a circumferential cut intermediate the length of each separated tube section from the outside to the ply forming the liner, and then slipping the inner with respect to the outer plies to eliminate the stepped ends on each tube section to form the paper can body with the telescoping section between the plies and an imperforate ply forming the liner.

5. The method of manufacturing paper can bodies with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper,

comprising the steps of making a pluralty of circumferental cuts spaced along the tube from the outside of the paper tube to the ply forming the liner, making a pair of alternate internal and external circumferential cuts spaced along the length of the tube with a pair between each of said first circumferential cuts, said internal cuts severing the liner and inner ply and said external cuts severing the paper in the tube from the outside to said inner ply, respectively, adjacent internal and adjacent external cuts being spaced substantially the length of a can body so that when said tube is separated at said internal and external circumferential cuts each tube section separated will have an internally stepped end and an externally stepped end with an outside circumferential cut to the liner, and then slipping the inner with respect to the outer plies to eliminate the stepped ends on each tube section to form the paper can body with the telescoping section between the plies and an imperforate ply forming the liner.

6. The method of manufacturing paper can bodies with a telescoping section and an imperforate liner from a paper tube formed from a plurality of plies of paper, comprising the steps of making a plurality of circumferential cuts spaced along the tube from the outside of the paper tube to the ply forming the liner, simultaneously making a pair of alternate internal and external circumferential cuts spaced along the length of the tube with a pair between each of said first circumferential cuts, said internal cuts severing the liner and inner ply and said external cuts severing the paper in the tube from the outside to said inner ply, respectively, adjacent internal and adjacent external cuts being spaced substantially the length of a can body so that when said tube is separated at said internal and external circumferential cuts each tube section separated will have an internally stepped end and an externally stepped end with an outside circumferential cut to the liner, and then slipping the inner with respect to the outer plies to eliminate the stepped ends on each tube section to form the paper can body with the telescoping section between the plies and an imperforate ply forming the liner.

7. The method of manufacturing a paper can body with a telescoping section and an imperforate liner from a paper tube formed from a plurality of wound plies of paper tape secured to form a paper tube having a paper ply inner tube with a paper ply liner which paper ply inner tube is separate and slidable within a paper ply outer tube, comprising the steps of performing a step forming operation on said paper tube so that said outer tube projects beyond said inner tube at one end and said inner tube projects beyond said outer tube at the opposite end so that said tube has an externally stepped end and an internally stepped end, making a circumferential cut intermediate the length of the tube from the outside to the inner ply forming the liner, and then slipping the inner tube with respect to the outer tube to eliminate the stepped ends to form the paper can body with the telescoping section between the inner tube and the outer tube with an imperforate continuous lining.

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