

Jan. 1, 1952

R. M. DUNNING ET AL

2,580,665

METHOD FOR FORMING PAPER CAN BODIES

Filed June 2, 1945

4 Sheets-Sheet 1

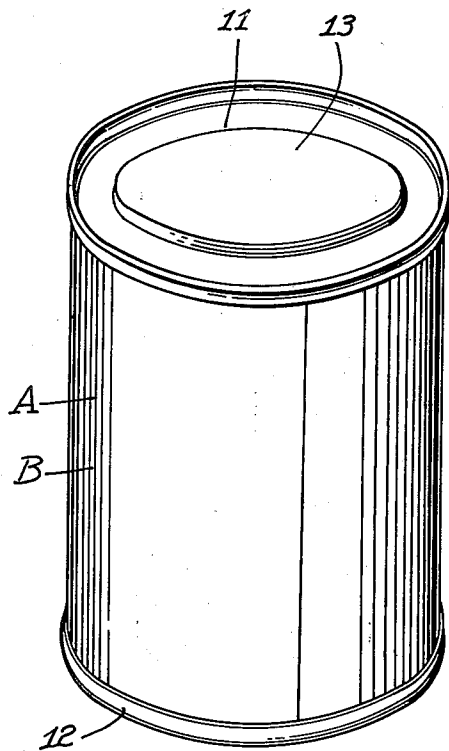


Fig. 1

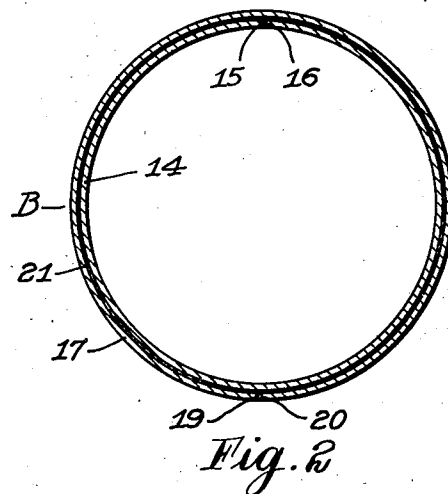


Fig. 2

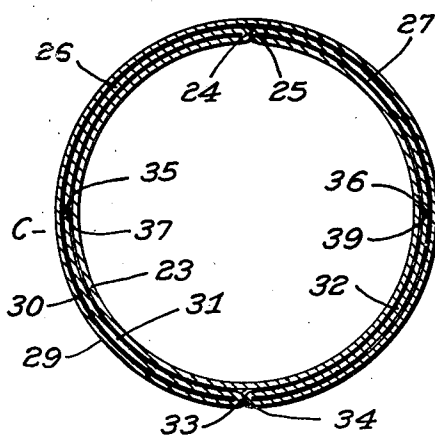


Fig. 3

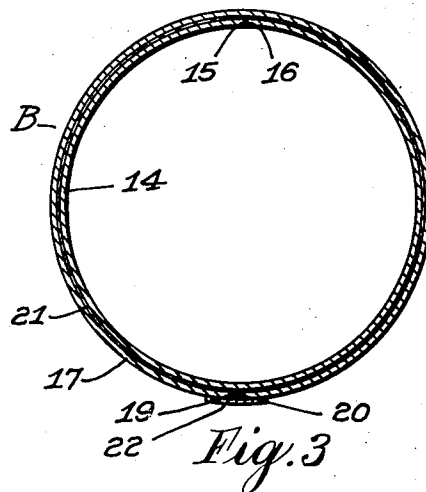


Fig. 4

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4 Sheets-Sheet 2

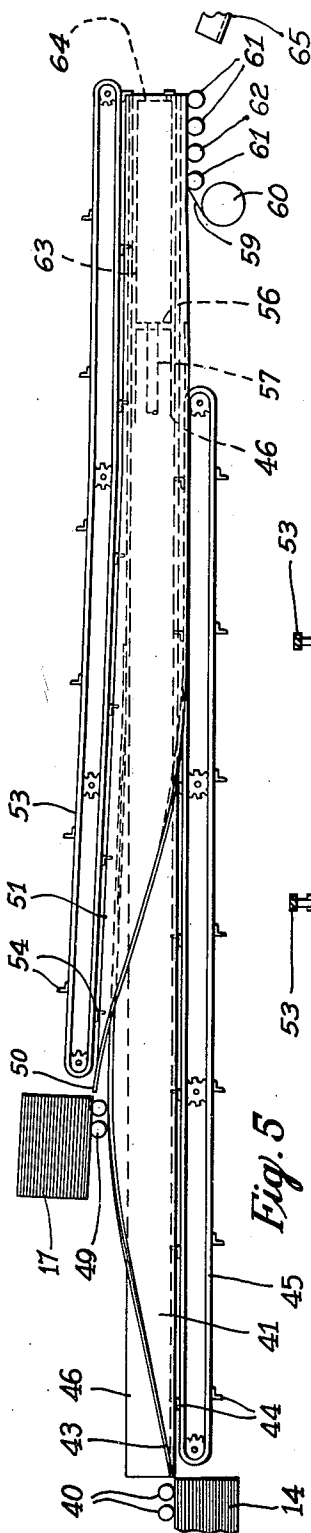


Fig. 5

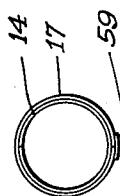


Fig. 18

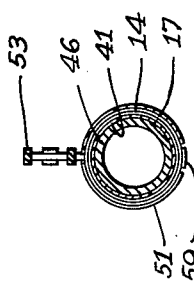


Fig. 17

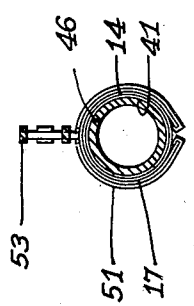


Fig. 16

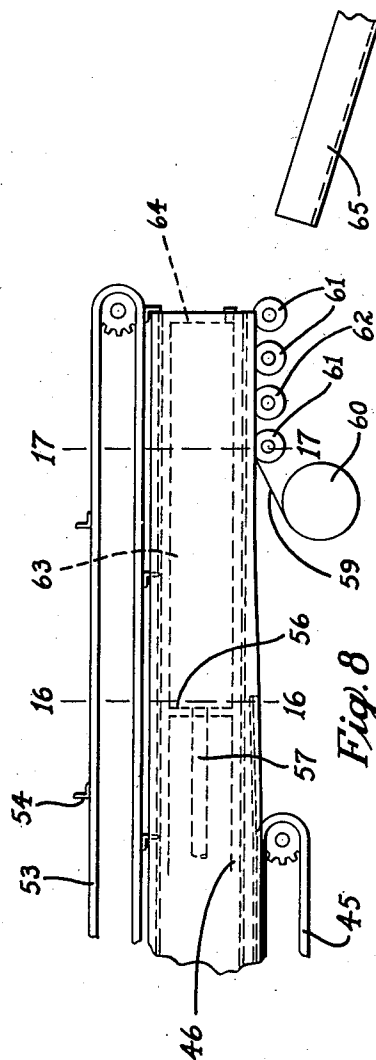


Fig. 8

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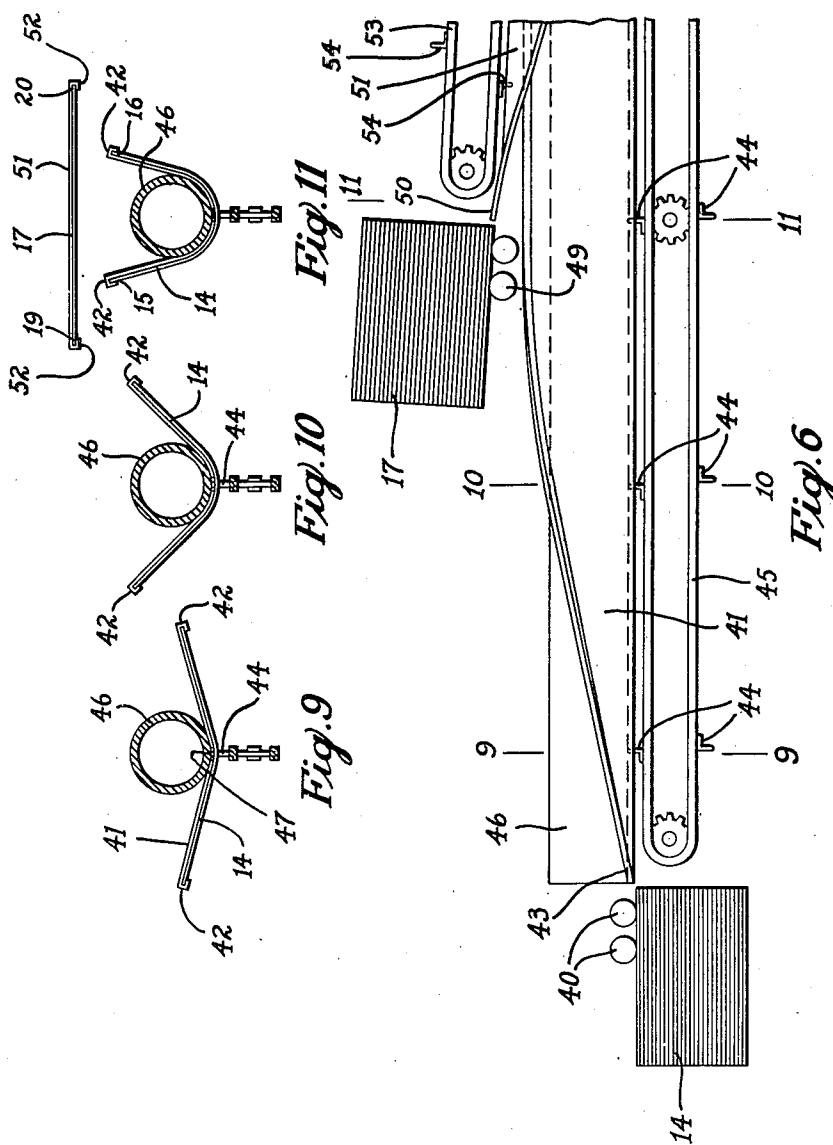
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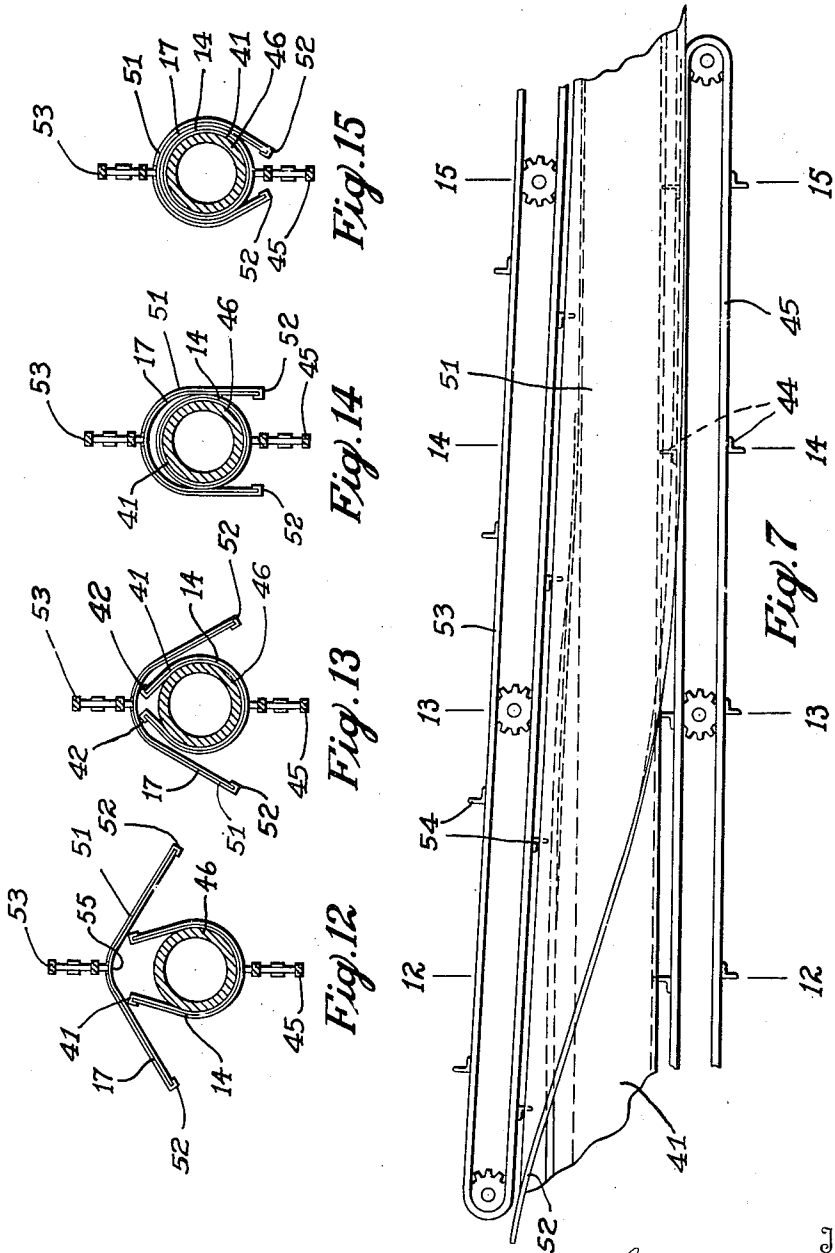
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METHOD FOR FORMING PAPER CAN BODIES

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11 Claims. (Cl. 93—94)

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Our invention relates to an improvement in method and apparatus for forming paper can bodies wherein it is desired to produce can bodies at low cost and at high speed.

Cans having at least the side walls thereof formed of paper or similar material have been constructed for a considerable number of years. Most of these can bodies are formed by spirally wrapping paper to form a tube to which end closures may be attached. While such can bodies have proven satisfactory insofar as containing packaged products is concerned, their manufacture has certain difficulties. In the first place such tubes normally must be formed in long lengths and then cut into smaller lengths, thereby requiring two separate operations. In the second place, it is usually necessary to either wrap a label on such a can body or else to print the body after formation thereof. Furthermore such can bodies often have spiral grooves extending about the same which detract from their appearance and strength.

It is the object of the present invention to produce can bodies out of flat sheets of paper stock. This flat stock may be easily printed before the bodies are formed, thereby obviating the requirement for a separate label. Furthermore, the can bodies may be stored in flat form until they are desired, and then quickly formed into tubular formation. As a result it is not necessary to maintain a large inventory of formed paper can bodies which require costly space to store before use.

A feature of the present invention resides in the formation of cylindrical can bodies by bending a plurality of flat sheets into tubular formation with one sheet overlying the other. As a result a cylindrical can body may be formed of a plurality of laminations of paper board or the like.

A further feature of the present invention lies in the provision of a can body constructed of sheets of paper board bent into cylindrical form to provide a laminated body, and in so placing the sheets that the butt edges of the various laminations are in angularly spaced relationship.

An additional object of the present invention is to produce a can body structure of a series of overlying sheets coated with a thermo plastic coating. Thus when the flat sheets have been bent into cylindrical form and are positioned in overlying relationship, these sheets may be adhered together by the application of heat and pressure.

These and other objects and novel features of

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our invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of our specification:

Figure 1 is a perspective view of a can, the body of which has been formed by our method.

Figure 2 is a sectional view through the can body showing the construction thereof.

Figure 3 is a view similar to Figure 2 showing the application of a strip of adhesive tape or the like to assist in holding the sheets in proper relationship.

Figure 4 is a sectional view through a modified form of can body construction.

Figure 5 is a diagrammatic side elevational view of our can body forming apparatus showing the construction thereof.

Figure 6 is an enlarged detailed view showing diagrammatically the forward end of the body forming apparatus.

Figure 7 is an enlarged view showing diagrammatically the intermediate portion of the can body forming apparatus.

Figure 8 is an elevational view showing in enlarged form the discharge end of the can body forming mechanism.

Figure 9 is a diagrammatic section on the line 9—9 of Figure 6.

Figure 10 is a diagrammatic section on the line 10—10 of Figure 6.

Figure 11 is a diagrammatic section on the line 11—11 of Figure 6.

Figure 12 is a diagrammatic section on the line 12—12 of Figure 7.

Figure 13 is a diagrammatic section on the line 13—13 of Figure 7.

Figure 14 is a diagrammatic section on the line 14—14 of Figure 7.

Figure 15 is a diagrammatic section on the line 15—15 of Figure 7.

Figure 16 is a diagrammatic section on the line 16—16 of Figure 8.

Figure 17 is a diagrammatic section on the line 17—17 of Figure 8.

Figure 18 is a sectional view through the completed can body.

In order that it be clearly understood what type of construction is to be formed by the method and apparatus shown, typical construction is shown in Figures 1 through 4 of the drawings. Figure 1 shows a can A having a side wall B made of paper or similar material which was bent from flat form into cylindrical form. The can A is shown having metal ends 11 and 12 which are crimped onto the ends of the side wall body B in

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the usual manner. The closure 11 may include a filling aperture normally closed by a plug cap 13 if it is so desired. Can ends of the type illustrated have been commonly used for a considerable period of years.

In order to show the construction of the side wall body A we have shown this body in section in Figure 2 of the drawings. Figure 2 illustrates an inner sheet 14 which is provided with butting longitudinal edges 15 and 16. This inner sheet 14 is encircled by a second or outer sheet 17 having butting longitudinal edges 19 and 20. The sheets 14 and 17 are secured together by any suitable means such as the layer of thermoplastic adhesive 21 between these sheets. Other adhesive could likewise be used but the thermo plastic adhesive is to be preferred.

In Figure 3 of the drawings I disclose the can wall body B which is identical with that shown in Figure 2 of the drawings, except that a piece of adhesive tape 22 is provided over the butting edges 19 and 20 of the outer sheet 17. This tape 22 may be paper tape bearing a suitable adhesive, may be transparent tape, or may be pressure sensitive tape if it is desired. Figure 3 merely illustrates the manner in which such a tape may be used if it is desired.

Figure 4 of the drawings shows a modified form of construction illustrating the manner in which a wall body having three plies may be constructed, if desired. In this type of construction C the inner sheet 23 is folded at 24 and 25 along parallel lines so that the longitudinal edges 26 and 27 thereof may overlies portions of the intermediate section of the sheet. In other words, the sheet is divided into three panels comprising an intermediate panel and two end panels foldably connected thereto along parallel fold lines. The end panels are of about one-quarter the area of the intermediate panel so that when the inner sheet is curved as illustrated in Figure 4, the outer panels 26 and 27 will form a substantially semi-circular double sheet.

The outer sheet 29 of the can wall body is formed similarly to the inner sheet and includes a central panel 30 and two end panels 31 and 32 connected thereto along parallel lines of fold 33 and 34. These end panels 31 and 32 comprise approximately one-quarter of the area of the panel 30 so that when the outer sheet 29 is folded as illustrated in Figure 4 the panels 31 and 32 form a substantially semi-circular double thickness portion.

When the two sheets 23 and 29 are folded as shown the marginal edges 35 and 36 of the panels 26 and 27 respectively, abut the edges 37 and 39 of the panels 31 and 32. Accordingly a can body is formed of three thicknesses of material which has no raw edges exposed either to the inside or to the outside of the body.

It will be noted that the can body material forming the liner of the wall is provided with two abutting folds 24 and 25, while the outer covering sheet 29 is likewise provided with two abutting folds 33 and 34, exposed to the outside of the can. The raw edges 35, 36, 37 and 39 are concealed, being locked between midpoints of the covering panels. As the ends of the tubular body are contained within the beaded edge of the can end 11, the can wall body is protected from wicking or moisture absorption.

In illustrating and describing the formation of the can bodies, the structure shown in Figure 3 has been used as an example. The struc-

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ture shown in Figure 2 is identical with that shown in Figure 3, except that the tape overlying the butting edges of the outer lamination is omitted. Similarly the construction shown in Figure 4 may be folded on the same mechanism as is used for folding the can wall B. In order to produce the wall C it is necessary to start the process described with sheets folded at 24, 25, 33, and 34. This folding operation may be separate from the operation shown in the drawings or may be employed as a primary step in the production of the can wall bodies illustrated. The manner of folding inwardly the ends of the body sheets is well known in the art and may be accomplished on folding machines well known to the trade.

With reference now to Figures 5 and 6 of the drawings it will be noted that the inner sheets 14 are stacked in feeding position in engagement with a suitable sheet feeding apparatus indicated by the numeral 40. This feeder 40 feeds each sheet successively beneath the sheet folding horn 41. The folding horn 41 may comprise a series of spaced bars or wires, but is shown in its simplest form as comprising a sheet of metal or the like having downwardly and inwardly turned marginal edges 42 thereupon. The main body of the folding horn 41 acts as a form about which the sheet is folded. The marginal edges 42 engage beneath the marginal edges of each successive sheet 14 so as to fold the sheet to the shape of the folding horn 41. As each sheet 14 enters the folding horn at its inlet end 43 the sheet is engaged by a lug 44 mounted upon an endless conveyor belt or chain 45. This lug 44 moves the sheet 14 longitudinally of the folding horn 41, the edges 42 of the horn acting to bend the sheet into cylindrical form as it progresses. The lugs 44 are spaced and are synchronized with the feeding mechanism 40. The feeder 40 acts to urge the sheet into the folding horn far enough to permit the same to be engaged by the lug.

Figure 9 indicates the position of the sheet at the line 9—9 of Figure 6. It will be noted that the sheet has been bent from its flat condition in which it was stacked to slightly bent form. The sheet is held against the folding horn by any suitable means such as by guides which are not illustrated, or may be held in place merely by contact with the endless belt or chain 45.

A folding horn 41 is supported by an inner tubular support 46 which is of a cantilever type. The inlet end of the support 46 is attached to any suitable supporting frame, while the outlet or discharge end of the apparatus is preferably entirely unsupported.

Figure 10 illustrates a successive step in the folding operation, this figure being a section at the line 10—10 of Figure 6. As will be noted in Figure 10 the folding of the sheet 14 has progressed considerably from the position of the sheet shown in Figure 9. In the position shown in Figure 10, the inner sheet 14 has been raised about one-quarter of its final circular form. The sheets 14 are preferably supplied in position to travel longitudinally of the grain of the paper as the sheets bend more easily with the grain running axially with the bend. The sheet continues to be driven by the lug 44. The center of the folding horn 41 may be slotted as indicated at 47 if it is desired so that the extremity of the lug may extend well above the level of the sheet 14. This structure insures the proper engagement of the sheet by the lug.

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Figure 11 of the drawings illustrates a later step in the folding operation, this view being a section on the line 11-11 of Figure 6. At this point of the bending operation the sides of the sheet 14 extend almost vertically and thus the sheet is wrapped almost into semi-circular formation. Also shown in Figure 11 is the first view of the outer lamination 17. This sheet 17 is positioned above the center support 46 and is later folded about the inner sheet 14 in such a way as to overlie the butt joint between the longitudinal edges 15 and 16 of the sheet 14.

The sheets 17 are stacked in sheet feeding position above the level of the support 46 and are fed by the sheet feeding mechanism 49 into the inlet end 50 of the folding horn 51. The folding horn 51 is arranged to fold the sheet 17 to overlie the sheets 14.

The folding horn 51 is shaped somewhat similarly to the folding horn 41, but it is inverted relative thereto. The folding horn 51 may be in the form of spaced bars or wires, but is shown in sheet formation. The folding horn 51 includes downwardly and inwardly extending flanged edges 52 which form channels for receiving the marginal edges 19 and 20 of the sheet 17.

A conveyor 53 is supported above the folding horn 51 to move the sheets 17 along the folding apparatus in unison with the sheets 14. The conveyor 53 is provided with a series of spaced lugs 54 thereupon which extend through a central slot 55 in the folding horn 51. These lugs 54 are designed to engage the rear edge of one of the sheets 17 as the sheet is inserted into the entrance end 50 of the folding horn 51 by the feeding mechanism 49.

As will be noted in Figure 12 of the drawings when the sheet 14 is wrapped about slightly more than one-half the circumference of a cylinder the sheet 17 has been folded partially. The sheet 17 is carried along above the sheet 14 and is positioned sufficiently above the sheet 14 to permit the ends of this sheet to extend somewhat above the level of the support 46. The folding horn 41 is thus downwardly inclined as illustrated. If the support 46 is of sufficient length the sheet 14 may be entirely folded before the folding of the sheet 17 is started, in which event the folding horn 41 need not be downwardly inclined.

Figure 13 illustrates diagrammatically the condition of the sheets 14 and 17 at a later stage in the folding operation. At this point the sheet 14 is almost entirely folded and the sheet 17 is wrapped about one-third of the circumference of a cylinder.

In Figure 14 the sheet 14 has been folded into circular form and the outer sheet 17 has been folded about one-half of the circumference thereof. It will be noted that the center portion of the sheet 17 is moving closer to the upper portion of the sheet 14 at this stage of the operation.

In Figure 15 the sheet 17 is illustrated as about two-thirds folded about the sheet 14 and closely approaching the same. Both sheets are being carried along by their respective conveyors which may be either in timed relation or arranged with the sheet 14 somewhat in advance of the sheet 17.

With reference now to Figure 16 of the drawings it will be noted that the sheet 17 is almost completely folded about the sheet 14. At about this stage of the operation the conveyor belt 45

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may terminate if desired and the two sheets may be carried in unison by the lugs 54 of the conveyor 53. Obviously in the event both conveyors are in timed relation, both conveyors may continue beyond this point. However, in the event the sheet 14 is somewhat in advance of the sheet 17 the sheet 14 will remain stationary for a short period of time until the sheet 17 is in registry therewith whereupon both sheets will be carried in unison.

In order to adhere the two sheets firmly together the outer surface of the inner sheet 14 and/or the inner surface of the sheet 17 may be coated with a thermoplastic adhesive. When the sheets have been formed into encircling formation with one sheet bound tightly about the other as illustrated in Figure 17 of the drawings, these sheets may be heated and pressed together so as to form a tight bond. This may be accomplished by any suitable means such as by providing a partition wall 56 in the tubular support 46 and in providing steam through any suitable inlet such as the steam pipe 57. As a result the entire free end of the support 46 is heated to a temperature sufficient to soften or melt the thermoplastic of the coating. This action tends to adhere the two sheets together under heat and pressure so as to form a secure bond therebetween.

If it is desired a strip of tape may be applied over the butting edges of the outer sheet 17 so as to hold the sheets in proper relation during the cooling of the thermoplastic adhesive. This tape 59 is supplied from a tape roll 60 and is applied by rollers such as 61, one of which, 62, may if desired form a cutting roller which will cut the tape to the proper length. Alternatively the steam chamber 63 between the partition 56 and the closed end 64 of the support 46 may be spaced from the extreme end of the support so that the tubular body may be chilled before leaving the support 46.

As indicated at Figure 8 of the drawings the completed tubular bodies are carried off the end of the support 46 and into any suitable conveying trough 65 or the like, or may be delivered to a suitable bin.

It will be noted that in our method we first fold the inner sheet either partially or entirely into cylindrical form and then fold the outer sheet about the inner sheet in such a way that the butt joints of the sheet edges are in angularly spaced relation. The sheets are then subjected to heat and pressure so as to adhere the same together, whereupon the tubular bodies may be released from the forming mandrel onto a suitable container or into a bin.

In accordance with the patent statutes, we have described the principles of construction and operation of our method and apparatus for forming paper can bodies, and while we have endeavored to set forth the best embodiments thereof, we desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of our invention.

We claim:

1. The method of forming a can body which includes the steps of moving a flat sheet of a length equal to that of the can body longitudinally and simultaneously folding the sheet about a longitudinal axis, moving a second sheet longitudinally and simultaneously folding the same about a longitudinal axis, the second sheet being

folded about the first sheet, and holding said sheets in tubular form.

2. The method of forming a can body of thermoplastically coated sheets having folded opposed marginal ends, the method consisting of folding one sheet into tubular form with the folded ends thereof outermost, folding a second sheet into tubular form to encircle the first sheet, the folded ends thereof being innermost and in abutting relation with the marginal ends of the first sheet, and applying heat and pressure to the sheets to adhere the same together.

3. The method of forming tubular walls from spaced flat sheets of a length equal to the length of the desired can body consisting in folding one sheet into tubular form so that the ends thereof are arranged in abutting relation, moving said sheet longitudinally during the folding operation, moving a second sheet in timed relation to said first sheet, folding the second sheet to enclose the first sheet so that the ends of the second sheet are arranged in abutting relation, and securing the sheets together.

4. The method of forming a tubular body from a pair of flat sheets of a length equal to the desired length of the tubular body, the method consisting in moving one sheet longitudinally and simultaneously folding the sheet into tubular form with the ends thereof abutting, moving a second sheet in timed relation with the first sheet and with the ends thereof in registry, folding the second sheet to overlie the abutting ends of the first sheet and to enclose the same, and securing the sheets together.

5. The method of forming a tubular body from a pair of flat sheets of a length equal to the length of the tubular body, the method consisting in moving one sheet longitudinally and folding the ends thereof upwardly to form a tubular body, moving a second sheet in timed relation with the first sheet so that the ends of the sheets are in registry, folding the ends of the second sheet downwardly to enclose the first sheet, and securing the sheets in tubular form.

6. The method of forming a can body from a pair of sheets of a length equal to the length of the tubular body, the method consisting in folding the ends of the sheets upon themselves to provide sheets of double thickness at the ends, moving one sheet with the folded ends underlying the adjacent portion of the sheet, folding the sheet into tubular form so that the folded ends thereof lie outwardly of the remainder of the sheet, moving a second sheet in timed relation to the first sheet, folding the second sheet with the folded edges thereof innermost into tubular form, the folded ends of the two sheets forming an intermediate layer between the remaining portions of the two sheets.

7. The method of forming a can body from a pair of sheets having the longitudinal edges thereof folded along parallel fold lines upon the adjacent portion of the sheet, folding one sheet into tubular form with the fold lines thereof in abutting relation, and with the folded ends of the sheet lying outwardly of the remainder of the sheet, folding a second sheet into tubular form to enclose the first sheet with the fold lines thereof in abutting relation and the folded ends thereof lying inwardly of the remainder of the sheet, the folded ends of the two sheets forming intermediate layer between the remainder of the sheets.

8. The method of forming a can body from a pair of sheets, which includes the steps of folding the ends of the sheets along parallel fold lines so that they overlie adjacent portions of the sheets, folding one sheet into tubular form with the fold lines thereof abutting and with the folded ends lying outwardly of the remainder of the sheet, folding the second sheet into tubular form with the fold lines thereof abutting and with the ends thereof lying inwardly of the remainder of the sheet, the folded ends of one sheet substantially abutting the folded ends of the other sheet to form a substantially continuous intermediate layer between the remainders of the sheets.

9. The method of forming a can body from a pair of sheets, which includes the steps of folding the ends of the sheets along parallel fold lines so that they overlie adjacent portions of the sheets, folding one sheet into tubular form with the fold lines thereof abutting and with the folded ends lying outwardly of the remainder of the sheet, folding the second sheet into tubular form with the fold lines thereof abutting and with the ends thereof lying inwardly of the remainder of the sheet, the folded ends of one sheet substantially abutting the folded ends of the other sheet to form a substantially continuous intermediate layer between the remainders of the sheets, and securing the sheets in this tubular form.

10. The method of forming a hollow tubular wall which comprises moving longitudinally a series of flat sheets in spaced relation and simultaneously folding each sheet about a longitudinal axis, moving a second series of spaced flat sheets longitudinally and folding each sheet of the last named series about a longitudinal axis, and about a sheet of the first named series with the ends of the concentric sheets in registry, and adhering the sheets together.

11. The method of forming hollow tubular can bodies from thermoplastically coated flat sheets which includes the steps of moving longitudinally a first series of flat sheets in spaced relation and simultaneously folding the same into hollow tubular form about a longitudinal axis, moving longitudinally a second series of flat sheets and simultaneously folding the second sheets into hollow tubular form about a longitudinal axis, and about the first mentioned sheet, the movement being timed to register the ends of the sheets, and applying heat and pressure to said sheets to adhere the same together while in hollow tubular finished form.

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