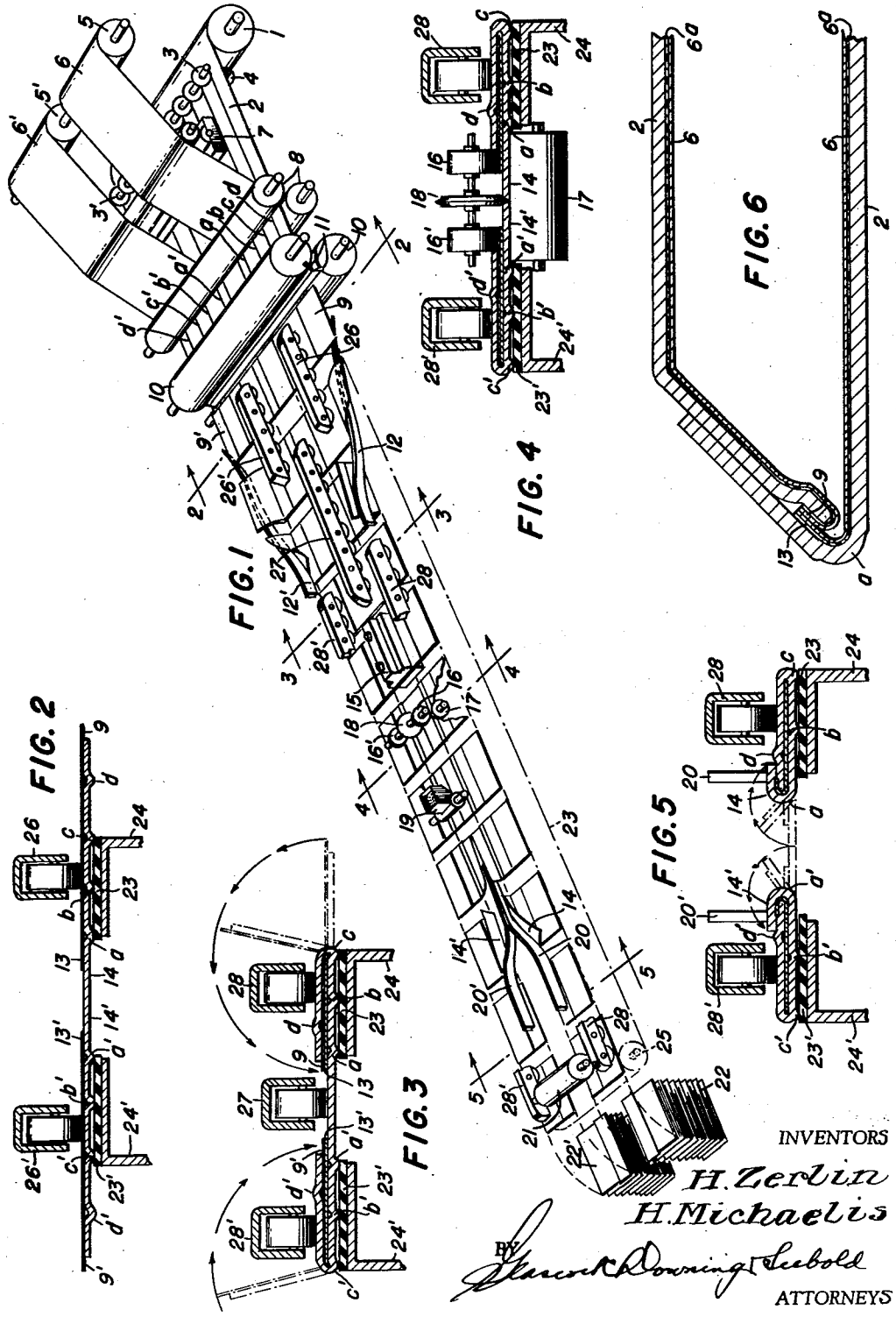
July 16, 1957 H. ZERLIN ET AL 2,799,211

METHOD AND APPARATUS FOR MANUFACTURING BLANKS FOR TUBULAR CONTAINERS HAVING MOISTURE RESISTANT LININGS

Filed Oct. 12, 1954



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United States Patent Office 2,799,211 Patented July 16, 1957

2,799,211

METHOD AND APPARATUS FOR MANUFACTURING BLANKS FOR TUBULAR CONTAINERS HAVING MOISTURE RESISTANT LININGS

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Application October 12, 1954, Serial No. 461,898

6 Claims. (Cl. 93—36.01)

The present invention relates broadly to the art of container manufacturing.

More particularly this invention relates to a method and apparatus for manufacturing container blanks for tubular containers and which blanks are provided with moisture resistant inner linings.

The invention is particularly concerned with a method and apparatus for manufacturing container blanks from paper, cardboard or other suitable carton forming material and which blanks when produced are in collapsed condition and erectable into tubular form and provided with an inner lining consisting of a foil or layer of synthetic material or a foil or layer coated with synthetic material and which material is moisture resistant and thus provides the container blank with an impervious inner lining.

In the manufacture of tubular containers, particularly those which are to be used for containing liquids or semi-liquid materials it is necessary that particular attention and efforts be directed to rendering such containers impervious. Apart from the question of choice of suitable material to render the container liquid tight, in tubular containers the seams that are termed the longitudinal or side seams must be carefully joined. Particular attention must be directed to ensure that the flap that is the end flap of the blank that is to be disposed interiorly of the container tube be so lined or covered that the marginal edge of this flap is so related with the overlapping flap forming the longitudinal seam that the liquid or semi-liquid contents in the finished container cannot pass between these flaps and thus escape from the container.

In view of this factor embodied in constructing tubular cartons, the prior art productions of blanks for tubular containers has contemplated the use of a lining or foil sheet of a size larger than the flattened carton blank so that during assembly and manufacture the portions of the liner or foil sheet that project beyond the marginal edge of the flap designated the inner flap of the longitudinal seam, are covered by folding this projecting foil portion or strip thereabout this marginal edge. Subsequently the flattened blank which has been provided with score lines is folded into tubular condition so that the said marginal edge that is now protected by the foil strip or lining material is placed in registry with the score line that is the inner boundary of the flap constituting the outer flap or overlapping flap of the longitudinal seam. Subsequently this overlapping flap is folded about the inner flap and thus the protected marginal edge thereof and the overlapping flap is joined to the inner flap. In the present construction, synthetic materials are used for liners that have impregnating and thermoplastic qualities, thus the thermoplastic foils and films that are used in the art require the use of heat and pressure for forming the longitudinal seams of the tubular carton. Consequently the use of heat sealing of the longitudinal seam gives rise to serious difficulties

in the production of the tubular blank in that the heat that is required to seal the foil or liner edges is transmitted or transferred to the inner flaps of the blank that are in superimposition so that the portions of the carton blank that are superposed and are adjacent the heat and pressure area are wholly or partially adhered together. This results in the difficulty that the flattened blank after the longitudinal seam has been effected by heat and pressure cannot be opened or set up to its full container size for filling. Similar difficulties apply when the tubular formation, that is the folding of the flattened blank into a flattened tube and the heat sealing of the longitudinal seam, is effected on a mandrel. In this instance the liner inner surface of the flattened blank under heat and pressure adheres to the surface of the mandrel, therefore it cannot be removed from the mandrel without recourse to additional procedures.

The present invention therefore has for an essential object to manufacture carton blanks in the form of collapsible and lined tubes in an expeditious manner and to eliminate the danger of any unnecessary adhesion of the inner sides of the flattened blank that are superposed in production to one another and also to effectively line the tubular and collapsible blank with a moisture resistant or impervious lining that prevents the escape of any liquid contents from a container made from the blank, with a particular reference to the seal between the marginal edge of the inner flap of the longitudinal seam and the adjacent corner edge of the outer flap of that seam.

In accomplishing this object the invention provides a method and apparatus in which the lining material or foil is superposed on the blank forming material in such fashion as to leave an overlapping or projecting foil strip so that prior to folding any of this foil strip about the marginal edge of the inner flap of the longitudinal seam the blank which has been previously scored is so folded as to register this said overlapping foil strip with the opposite longitudinal edge portion of the foil lining and then only the thus overlapped and narrow foil portions are adhered together and to the inner edge of the outer flap of the longitudinal seam following which the outer flap together with the aforementioned foil strips are secured to the inner flap, by folding thereover and with the use of adhesive or pasting action that does not require the application of heat. It is therefore seen that this invention has a further object to provide, in the formation of a collapsed carton blank of tubular and lined form a longitudinal foil seam in a restricted region in which the foil overlies only a single ply or thickness of the blank material so that the remaining foil or lining material surfaces are not influenced by any heat effect and cannot adhere together.

As an additional object and in order to obtain a tight and effective longitudinal seam, the invention provides a method and apparatus in which the marginal portion of sheet or foil of lining material which is applied to the scored blank forming material is folded so that the longitudinal edges are superimposed so that the heat sealing is only to penetrate the relatively thin layer of lining material in order to become effective. In the final step of forming the collapsed tubular blank, the flap forming the outer flap of the longitudinal seam and the portions of the foil or lining that have been longitudinally seamed are provided with a binder, folded 180° about the score line defining one corner of the carton with the marginal strip of foil that had been projecting beyond the marginal edge of the flap constituting the inner flap of the carton seam being folded about this said marginal edge to securely protect the same. The invention contemplates method steps and apparatus effecting the securing of the outer flap to the inner flap of the longitudi-

nal carton seam by using a conventional binding material that adheres without heat so as to prevent any unnecessary and undesired adhesion of any superimposed foil surfaces to one another.

It is a further object of this invention to provide a method and apparatus which doubles the production output of collapsed tubular blanks and while necessitating the use of certain method steps does so without increasing the essential steps and apparatus adjuncts required for forming a single collapsed blank.

In accomplishing this object the invention provides a series of steps and apparatus components including and capable of uninterruptedly feeding a web of carton forming material of a width corresponding to double the width of a single flat blank, superimposing and adhering onto the web while it is moving separate sheets of lining material having heat activatable adhesive qualities in transversely spaced relation to leave a center portion of the web exposed and with the outer marginal edges of the lining material webs projecting beyond the longitudinal edges of the carton forming web and subsequently subjecting the thus assembled web to coordinated, cutting, folding and adhering actions to simultaneously transform each half of the assembled web to a flattened tubular carton blank.

The steps of the method and the coordination of the apparatus components are effected in a sequence such that prior to mounting the two webs of foil or other suitable lining forming material onto the web of carton forming material the latter is provided with longitudinal score lines to define the lines of fold for manufacture of the blank and subsequent erection thereof. Subsequent to the step of mounting the foil or liner webs, the assembled liner and carton forming web are transversely severed by cross cutters into sections each the width of two carton blanks following which the exterior margins of these sections are folded about one of the aforementioned score lines by 180° to superimpose the projecting portions of the respective foil webs upon the opposite marginal portions of the respective foil webs and in this superimposed position subject the thus superimposed foil portions to heat sealing.

Preferably and simultaneously with the final phase of the heat sealing step or immediately thereafter, the double blank forming sections are severed longitudinally and medially thereof so that during succeeding operations the outer flap of the longitudinal seam which has been freed by this severing step can be coated with adhesive and folded about the adjacent portion of the blank section that comprises the inner flap of the lining tube secured thereto solely by pressure.

In the carrying out of the present invention, it is particularly advantageous to effect longitudinal scoring of the carton forming web prior to mounting and adhering the webs of lining material thereto. This prevents damage to the thin lining material or foil and which damage would occur if the score lines were applied by scoring tools after the lining was applied to the carton forming web. The damage effected by scoring tools pressing on the lining material would result in leakage in the finally produced container.

A further advantage for effecting the various steps in the sequence set forth in the foregoing resides in the fact that the longitudinal cutting step, that is the subdivision of the blank sections into separate blank sections, is effected at a time at which, disregarding the final and ultimate folding of the outer flap to effect the longitudinal carton seam, all of the essential steps for forming a tubular blank in flattened condition have been completed. Therefore most of the steps of manipulations of the material are performed on what can be termed a double blank and while the two blank sections are still connected so that guiding and movement thereof during the various phases of production is substantially facilitated. Furthermore the preparation of flattened blanks of tubular form in a double width web entails the advantage that the apparatus components, namely, the scoring tools, cross cutter, heat sealing mechanism and adhesive applying devices operate simultaneously on both halves of the blank surfaces thereby simplifying the construction and drive of the apparatus.

In the form of the invention described hereinafter, an arrangement is set forth which effects in a continuous operation the feeding of the carton forming web and lining webs off supply rolls and during their subsequent uninterrupted forward motion the transformation of these webs into a collapsed tubular blank. Since tubular containers in use are generally provided with legends or other indicia on the outside, the carton forming web can have such printing or indicia applied thereto before it is placed on the supply roll or a suitable printing mechanism can be utilized immediately after winding off the web from the roll. In such instances spacing mechanism of a known type can be coordinated with the cross cutters to assure that the superposed webs are transversely severed at the proper intervals.

The invention further contemplates an arrangement which can be so constructed that in one machine is effected the longitudinal scoring, the mounting of the foil or liner material on the carton forming web and the severing of the thus assembled blank forming web transversely into a flat single or double size container blank. The output from this machine can be stacked and fed to another machine which effects the folding and adhering of the flat blank into a collapsible tubular blank or blanks.

Further and more specific objects will be apparent from the accompanying drawings, in which:

Figure 1 is a diagrammatical perspective view of apparatus carrying out the method of the present invention as specifically applicable to the continuous and simultaneous formation of plural stacks of flattened tubular carton blanks,

Figures 2 to 5 are vertical sectional views taken through the web of carton forming material or through the blank carton forming blank sections respectively and illustrating the essential phases of the operation of forming the blanks,

Figure 6 is a fragmentary view in section and on an enlarged scale illustrating a partially erected or open tubular blank.

As is clear from Figure 1, the carton forming web **2** is fed forwardly from a supply roll **1** by feeding rolls, not shown. The web **2** is guided through a device including the scoring discs **3** and a counter roll **4** and is provided with the groups of longitudinally extending score lines *a*, *b*, *c* and *d* and *a'*, *b'*, *c'* and *d'*. In the embodiment illustrated, the width of the web **2** coincides with the width of two carton blanks in flattened condition. An additional pair of supply rolls **5** and **5'** are supported above the web **2** and webs **6** and **6'** of foil such as Pliofilm or other lining material, the upper sides of which are coated with a thermoplastic resin *6a*, are fed into superimposition with the web **2**. In reaching this position the web **6** passes over adhesive applying mechanism **7** of known construction which includes an adhesive containing tank, a dipping roll and an applicating roll for transferring the film of adhesive to the undersurface of the webs **6** and **6'**. In the further movement of the webs **6** and **6'** they are superimposed upon the web **2** of the carton forming material and guided between a pair of superposed rollers **8**. The webs of liner forming material or foil are secured to the web **2** in such fashion that a median strip of the web **2** remains uncovered while the webs **6** and **6'** respectively have marginal portions projecting beyond the outer marginal edges of the web **2**. These projecting portions of the liner forming webs are denoted at **9** and **9'**.

The double ply web thus formed comprising the carton forming web **2** and the superposed and adhered liner

forming webs 6 and 6' now constitutes a stock web. The stock web after passing between the rollers 8 is passed through a transverse cutter which includes upper and lower rollers 10 having cutting knives 11 on their respective peripheries. Since cartons generally have indicia or other printed matter thereon and as has been indicated previously the stock web has had this printed matter applied thereto, it is necessary to install a known type but non-illustrated mechanical or photoelectric uniform spacing mechanism in association with the transverse cutter device whereby the stock web is successively cut in the same spot so that all of the ensuing blank forming sections are of the same size. Such a control device is published for instance by the German Patent No. 883,512.

After the stock web has been cut into sections, the sections successively move into the sphere of influence of stationary folding means 12 and 12' which fold the sections respectively about score lines *c* and *c'* by 180° so that as seen in Figure 4 the projecting strips of liner material or foil 9 and 9' are superimposed over the portions 13 and 13' respectively comprising strips along the inner marginal edges of each of the liner sections. As shown in Figure 2, the strips 13—13' extend inwardly of the score lines *a* and *a'*, a distance of substantially the same as the amount of the projection of the liner strips 9 and 9'. The portion of the stock web denoted at 14 and 14' is that area of the finished carton blank which constitutes the outer flap of the longitudinal seam whereas the portion of the stock web between the respective score lines *d* and *d'* and the adjacent marginal edges of the web 2 constitute the inner flaps of the longitudinal seam.

Figures 2 and 3 illustrate the first 180° folding movement that is imparted to the stock sections on the opposite sides thereof. After this first movement has been completed so that liner strips 9 and 9' are superposed over 13—13', the still connected blank forming stock sections pass beneath a preheating device noted at 15 which renders the thermoplastic coated sides of the strips 9 and 13 and 9' and 13' adhesive and thence beneath the heat sealing mechanism including an underlying counter roll 17 and sealing discs 16, 16'. By the sealing discs 16, 16' in connection with the counter roll 17 only seal portions 9 and 13 will be welded, whereas the underlying surface of marginal strip 13 is sealed to the top of the median portion 14 by adhesive and the superposed rollers 8 at the beginning of the operation. The counter roll 17 has a length such as to extend across the space between the outer sides of the rolls 16, 16' respectively as indicated in Figure 4. Simultaneously with this heat sealing step in which the projecting strips 9, 9' are sealed to strips 13, 13' the stock section is severed longitudinally into two blank forming sections by a slitting disc 18. This disc or knife 18 is also carried on the same shaft that carries the rollers or discs 16, 16'. These rollers may be heated if required.

As has been pointed out previously the actual heat sealing that is applied to the stock sections is effective only in that area underlying the discs 16, 16'. Thus the remaining portions of the foil or liner material sections are not influenced by the heat of the heat sealing step and the layer of carton forming material underlying the superposed foil or liner strips is only of single thickness thus ensuring an effective seal of the seam.

The action of the cutting disc 18 in separating the stock section into individual blank forming sections frees flaps 14, 14' for the folding movement as illustrated in dotted lines in Figure 5. The flaps 14, 14' constitute the outer and overlapping flaps of the longitudinal seam for the finished carton blank. As shown in Figure 1 following the severing of the stock sections into two blank forming sections the two sections are fed beneath the binder applying device 19 so that a binder is applied to the flap portions 14, 14' and the now upper portions of the liner or foil strips 9, 9'. Following the application of binder, the respective blank sections are engaged by folding means 20, 20' which fold the flaps 14, 14' by 180° about score lines *a*, *a'* and thus around the marginal edges of the inner flap sections of the longitudinal seam. As shown in Figure 5, the flaps 14, 14' have such extent as to substantially cover the underlying portions of the blank sections extending between the score lines *d*, *d'* and the marginal edges. After the adhesive applying and folding steps just mentioned the two now tubular form blank sections are completed by passing between a pair of pressing rollers 21. If desired, more than one pair of pressing rollers can be employed. Following the pressing action, the respective now flat and tubular blanks are deposited in piles 22 and 22'.

In order to transport and guide the blanks after their separating from the web two continuously running endless belts 23 and 23' are provided which glide over the fixed rails 24 and 24' and are driven by the rollers 25. Above the track, roller bars 26, 26', 27, 28 and 28' are fitted to press the blanks on the belts 23 and 23' and thus guide their forward movement.

The now formed tubular blanks can be erected or set up in open condition for insertion of closures and filling and finally converted to filled and closed containers by other mechanism.

It is to be understood that while the invention has been described with reference to an embodiment which simultaneously produces two piles of collapsed tubular carton blanks by a series of successive steps, the invention is not to be limited to this form since the inventive steps are applicable to the continuous formation of single blanks in flattened condition. Further the spirit of the invention is not to be limited to a single carton blank forming plant as illustrated since as previously indicated the mounting of the webs and severing thereof into what is termed stock sections can be performed by one machine and the subsequent folding, heat sealing, slitting and end flap seam sealing can be effected by another machine.

Further it is not essential that the web 6 and 6' be coated with thermoplastic material since the lining material can consist of a thermoplastic film or web. An important aspect of the invention resides in the limited and confined sphere of heat sealing applied directly to only narrow strips of liner material or foil so that the balance of the material of which the liner is made is not unduly influenced by heat so as to cause adhesion between the then superposed portions of liner material. Further the heat applied by the heating device 15 is limited to the regions between the score lines *a*, *a'* and of course at a time when only a single thickness of carton forming web underlies the overlapped strips of liner material. Thus in effect the overlapped liner strips are adhered together.

What is claimed is:

1. The method of manufacturing flattened lined tubular blanks comprising feeding a web of carton forming material of a width sufficient to provide two flat blanks, feeding and mounting in superimposition on the first mentioned web transversely spaced webs of liner material having heat activatable adhesive properties with a strip extending along the remote marginal portions of the liner web projecting beyond the corresponding marginal edges of the underlying web of carton forming material and leaving an exposed median strip of carton forming material between the webs of liner forming material, and severing the now mounted webs transversely of the direction of feed to provide successive double sized flattened blanks, simultaneously folding the opposite marginal edge portions of the double sized blank inwardly about axes parallel to the direction of feed to superimpose the projecting marginal portions of liner material upon the marginal portions of liner material adjacent the median line of the double sized blanks, simultaneously subjecting the now superimposed marginal portions of liner material and underlying single layer of carton forming material to heat and pressure to adhere at least the superimposed marginal portions of liner material together, severing the double sized blank longitudinally along the median line

to provide two partially formed tubular blanks and simultaneously folding the thus severed median portions of carton forming material and overlying adhered marginal portions of liner material about the initially folded marginal edges of the respective blanks and adhering the same together in overlapped relation by pressure activatable adhesive.

2. The method of manufacturing flattened lined tubular blanks as claimed in claim 1 in which the double sized flattened blank is severed longitudinally simultaneously with effecting the application of pressure to the superimposed marginal portions of liner material.

3. The method of manufacturing flattened lined tubular blanks as claimed in claim 1 in which the pressure activatable adhesive is simultaneously applied to both partially formed blanks immediately following the longitudinal severing of the double blank upon the superimposed adhered marginal portions of liner material and the portion of the carton forming material extending outwardly from the said superimposed adhered marginal portions of liner material to the severed edges prior to effecting the final folding step.

4. Apparatus for manufacturing flattened lined carton tubes including means for feeding a web of carton forming material of a width double that required to form one blank, means for longitudinally scoring the web with two laterally spaced groups of score lines, each group defining fold lines including a laterally outermost fold line and an innermost fold line with the area of the web between the remote outermost fold lines and the marginal edges of the web constituting an inner side flap in a finished carton and the area between the innermost fold lines of the respective groups constituting a median strip of a width sufficient to define the outermost side flaps of two cartons, means for feeding two webs of liner forming material spaced transversely relative to the direction of feed of the first mentioned web upon the first mentioned web with the remote marginal edges of the respective webs of liner material projecting laterally beyond the opposite marginal edges of the web of carton forming material, means for securing the webs of liner material to the web of carton forming material, means for severing the secured webs transversely of the line of feed into blank sections each of a width corresponding to the width of two carton blanks, means for simultaneously folding the opposite lateral ends of the respective double sized sections inwardly upon themselves to superimpose the portions of the webs of liner material that project beyond the marginal edges of the sections upon the corresponding and underlying marginal portions of the webs of liner material adjacent the respective opposite marginal ends of the said webs of liner material and extending inwardly from the innermost fold lines, means for subjecting the now superimposed marginal portions of the webs of liner material to heat and pressure to effect a seam, means for severing the now partially formed double blank into individual tube forming segments, means for applying pressure activatable adhesive to the superimposed and adhered marginal portions of the webs of liner material and the respective portions of the web of carton forming material extending laterally inward of the innermost fold lines, means for folding the last mentioned portions of the web of carton forming material and the superimposed and adhered marginal portions of the webs of liner material about the respective innermost fold lines and thus about and over the free marginal edges of the first folded lateral ends and means for subjecting the now superposed portions to pressure to adhesively secure the same together to provide in a single sequence of operation a pair of similar flattened lined tubes for subsequent erection into cartons.

5. Apparatus for manufacturing flattened lined container tubes as claimed in claim 4 in which the means for subjecting the superimposed marginal portions of the webs of liner material to heat and pressure includes a counter roll extending transversely of the line of travel of the double sized blank sections and disposed beneath the same, a shaft parallel to the counter roll and disposed above the line of travel, heated pressure rollers carried by said shaft and spaced apart a distance such as to overlie the respective superposed marginal portions of the webs of liner material in transit therebeneath and a circular knife mounted on said shaft intermediate the said rollers for severing the double sized blank section into the individual blank tube forming segments and the said counter roll simultaneously cooperating with the said rollers and knife.

6. Apparatus for forming flattened lined tubes from tube forming blank sections having a width twice the extent of a single blank and further having longitudinal score lines defining two laterally spaced groups of fold lines, each group including a laterally outermost and a laterally innermost fold line, and adhered sections of liner forming material including opposite remote marginal edges projecting beyond the opposite marginal edges of the blank forming material and inner marginal edges transversely spaced to expose a median strip of blank forming material and said blank forming material being longitudinally scored to define flap and corner fold lines for a group of panel portions for each of a pair of cartons comprising means for simultaneously folding the opposite lateral ends of the respective double sized sections inwardly upon themselves to superimpose the portions of the layers of lining material that project beyond the remote marginal edges of the sections upon corresponding and underlying marginal portions of the layers of lining material adjacent the respective opposite marginal ends of the said layers of lining material and extending inwardly from the innermost fold lines, means for subjecting the now superimposed marginal portions of the layers of lining material to heat and pressure to effect a seam, means for severing the now partially formed double blank into individual blank forming segments, means for applying pressure activatable adhesive to the superimposed and adhered marginal portions of the layer of lining material and the respective portions of the layer of carton forming material extending laterally inward of the innermost fold lines, means for folding the last mentioned portions of the layer of carton forming material and the superimposed and adhered marginal portions of liner material about the respective innermost fold lines and thus about and over the free marginal edges of the first folded lateral ends and means for subjecting the now superposed portions to pressure to adhesively secure the same together to provide in a single sequence of operation a pair of similarly flattened lined tubes for subsequent erection into cartons.

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